



Maintenance & Operating **MANUAL**

DE-1000 CENTRIFUGE GEARBOX DRIVE

MINERAL PROCESSING, INDUSTRIAL & ENVIRONMENTAL APPLICATIONS:

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HOW TO USE THIS “e-MANUAL”

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NAVIGATIONAL TOOLS

A portion of the menu bar and associated navigation tools for Adobe Acrobat is shown below. A brief description of these tools is presented below. Additional information concerning other features and navigational tools is available by selecting “Acrobat Help” or “Adobe on line” from the “Help” drop-down menu provided at the top of the screen.

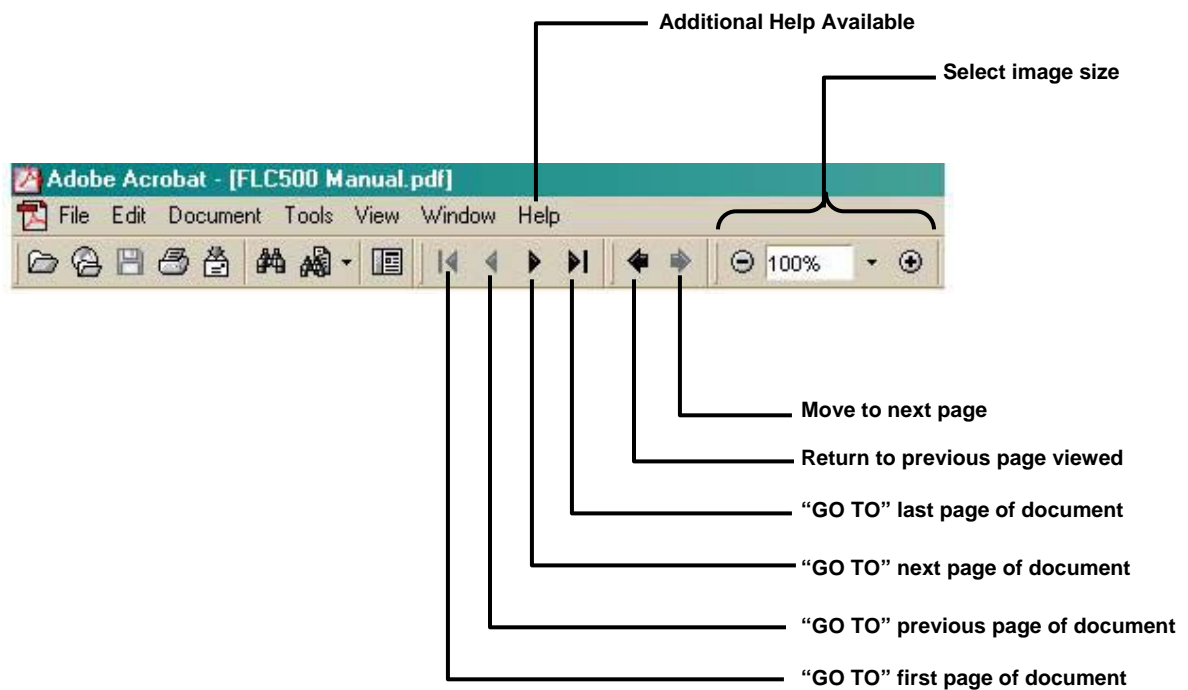




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INTRODUCTION

DE-1000 CENTRIFUGE - GEARBOX DRIVE

OVERVIEW

This manual provides instructions for installing and operating the DE-1000 Gearbox Drive (GBD) centrifuge (Figure 1019-1). The manual is divided into several sections to assist the user in readily accessing the information. Instructions include description, theory of operation, safety, installation, and maintenance. Reference drawings are provided to facilitate parts location and ordering, as well as for understanding of equipment operation and assist in troubleshooting. The manual also contains technical documentation provided by outside suppliers. These documents cover components used in the centrifuge but not manufactured by Derrick.



Figure 1019-1 DE-1000 Gearbox Drive (GBD) Centrifuge

EQUIPMENT USE

The DE-1000 GBD centrifuge is designed expressly to remove low specific gravity solids from slurries. In one type of processing, solids are removed and the liquid is returned for recirculation. In the other type of processing, solids are returned to the active system and the liquid is discarded.

Derrick Corporation does not authorize any other use of this equipment. Intended usage of the equipment includes compliance with the operating, maintenance, and safety procedures included in this manual.

Personnel responsible for transporting, installing, commissioning, operating, adjusting, or maintaining this equipment should be required to read and understand the instructions in this manual. One copy of this manual should be available and accessible at the equipment location.

For maximum safety and performance, no additions and/or changes may be made to the equipment without the explicit written permission of Derrick Corporation. Genuine Derrick repair/replacement parts are required.

CONTACT INFORMATION

CONTACT INFORMATION			
Location	Telephone	Facsimile (FAX)	E-Mail / Website
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PRODUCT SUPPORT

Derrick Corporation offers 24-hour per day, 7-day per week product support. Product support includes screen replacement / ordering information and repair / replacement parts and service for the entire product line. Refer to the following table for the parts / service center nearest you.

PARTS SALES & SERVICE		
CALIFORNIA		
	Bakersfield	800.999.2917
	Woodland	530.666.6475
COLORADO		
	Denver	303.592.9250
LOUISIANA		
	Broussard – <i>Sales</i>	877.635.3354
	Broussard – <i>Leasing</i>	800.234.6153
OKLAHOMA		
	Oklahoma City	800.678.6537
TEXAS		
	Houston – <i>Sales</i>	281.590.3003
	Houston – <i>Leasing</i>	281.209.1300
	Corpus Christi	800.884.6065
	Midland	915.561.8455
WYOMING		
	Casper	307.237.4441
OUTSIDE USA: 800.873.3002		

HIGHLIGHTED INFORMATION

Information considered important to safe and effective operation of the equipment is highlighted as illustrated below:

Safety Issues



WARNING! PRESENTS INFORMATION CRITICAL TO SAFE OPERATION AND/OR MAINTENANCE OF THE EQUIPMENT. FAILURE TO COMPLY WITH THIS INFORMATION MAY RESULT IN SERIOUS INJURY TO PERSONNEL AND/OR DEATH, OR MAJOR DAMAGE TO THE EQUIPMENT.

THIS STYLE OF HIGHLIGHTED INFORMATION WILL PRECEED THE TASK AND/OR PROCEDURE THAT IS DANGEROUS TO PERSONNEL AND/OR DETRIMENTAL TO THE EQUIPMENT.

General Information



Note! Identifies information that will assist operating and maintenance personnel in simplifying tasks and/or procedures and provides suggestions for maximizing equipment performance.

SAFETY INFORMATION

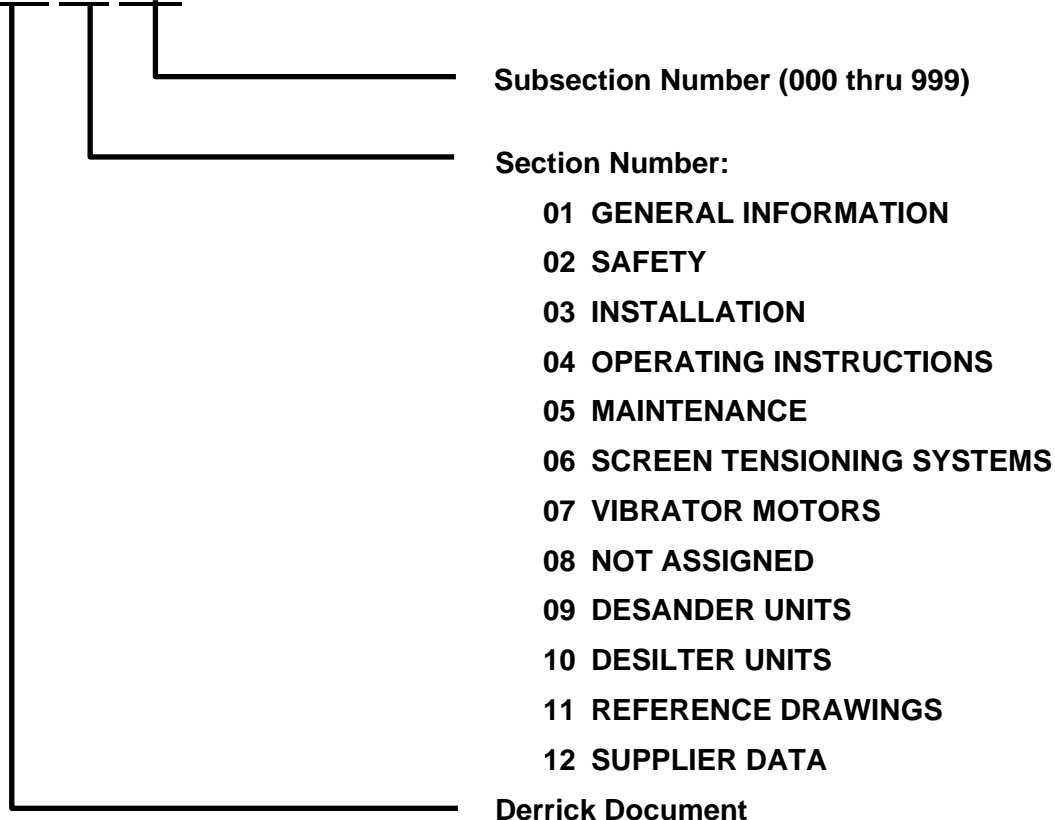
The equipment has been designed to safely perform the stated functions of the equipment. All persons responsible for operation and maintenance of this equipment must have read and understand all information presented in this manual prior to operating/maintaining the equipment.

Section 2 of this manual contains relevant safety information relating to both operation and maintenance of this equipment. Be sure this information is read and understood.

DO NOT operate equipment if defective or faulty mechanical or electrical components are detected.

HOW TO USE THIS MANUAL

DER XX 000



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DESCRIPTION AND OPERATION

DE-1000 CENTRIFUGE - GEARBOX DRIVE

GENERAL

The centrifuge is a high-speed electro-mechanical machine using a 50 HP electric motor to drive the bowl assembly and conveyor. The centrifuge receives slurry through a feed tube at the pulley end (solids discharge) of the machine. The slurry is dispersed into the rotating bowl, where centrifugal force is employed to separate liquid from the solids. Liquid flows out the liquid discharge Victaulic® connection at the gearbox end of the centrifuge, while solids are conveyed to the solids discharge located at the pulley end of the machine. The solids fall into a chute at the bottom of the machine.

The centrifuge is configured at the factory to operate on a specific AC voltage supplied in three-phase, 50Hz or 60Hz. The specified power configuration must be supplied to the machine. Electrical controls are mounted on the electrical control box located at the machine's liquid discharge end. Safety devices built into the centrifuge protect personnel and equipment by shutting down the drive motor in case of excessive conveyor pressure, high motor temperature, vibration, or other malfunction.

OPERATING PRINCIPALS

The centrifuge employs G forces produced by the high-speed rotation of a cylindrical bowl to separate solids from a slurry. Centrifuge performance is based on three variable factors:

- G force exerted on the fluid - Gravitational force pulling fluid against the outside wall of the centrifuge
- Retention time in the centrifuge - The longer the slurry remains in the centrifuge the smaller the particle that can be separated
- Differential speed of conveyor - The faster the conveyor rotates, the wetter the solids and the more solids that are discharged

All three factors may be manipulated in the Derrick DE-1000 GBD centrifuge to alter the liquid and solids discharge. The G force is adjusted by changing the motor sheave to vary the bowl RPM. Retention time is controlled by adjusting the liquid discharge ports on the liquid bowl head to vary the pond depth (depth of liquid remaining in the bowl), and the conveyor differential speed may be altered by changing gearbox ratio. The conveyor operates at a lower speed than the bowl; its speed is derived from the gearbox ratio. The conveying speed is the difference between the bowl and conveyor speeds.

Beyond centrifuge modifications or adjustment, the feed rate may be varied. Changing the feed rate provides an additional means of altering the discharge results. Adjusting any parameter—pond depth, bowl speed, and conveyor differential speed—requires shutdown of the equipment. For best performance, the slurry should be screened to 74 microns in vibrating screening machines before passing it to the centrifuge.

OPERATING PRINCIPALS (CONT'D)

During centrifuge operation, slurry is pumped through the feed tube into the center of the rotating conveyor (Figure 1120-1), where it splashes against the feed accelerator. The high velocity slurry is then dispersed out four feed nozzles mounted in the periphery of the conveyor cylinder. Rotating at a higher speed than the conveyor, the bowl creates an additional shearing effect, which further increases the slurry's acceleration. The depth of the slurry in the bowl (pond depth) is determined by the setting of weirs on the liquid bowl head (large end of the bowl).

As the slurry flows in the channels between the conveyor flights, the heavy particles settle at an accelerated rate due to the G force imposed by the rotating bowl. Sand particles settle almost instantly; then the finer, lighter particles settle. Particles that cannot be settled under the present centrifuge settings will be discharged with the liquid through the adjustable weirs on the liquid bowl head. Liquid exiting the liquid bowl head is directed through the liquid discharge outlet.

The settled solids form a cake on the inside of the bowl and are transported by the conveyor toward the narrow end of the bowl, or beach. As the solids travel across the beach, their free liquid film is lost due to centrifugal squeezing and drainage. When they are discharged at high velocity through the solids discharge ports on the bowl, they contain only the adsorbed moisture.

Since the discharge cake is very heavy and sticky because of the lack of free liquid, the centrifuge should be installed over the receptacle that is to receive the discharged solids. If this is not possible a slide or chute is needed to convey the solids. At least a 45-degree angle is required to ensure self cleaning, or a wash system must be provided to prevent material buildup.

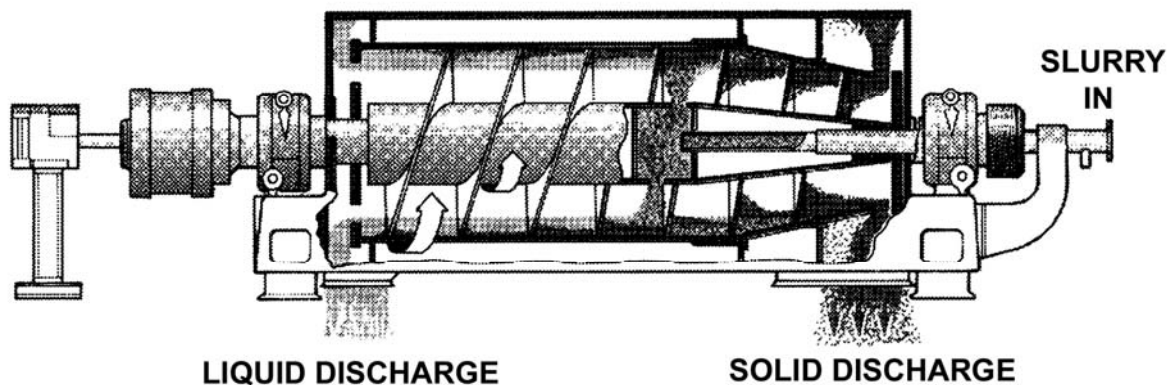


Figure 1120-1 Centrifuge Operation

MAJOR COMPONENTS

Major components of the centrifuge (Figure 1120-2) consist of the rotating assembly, gearbox drive assembly, fluid coupling, electrical control box, 50 HP electric motor, vibration switch, case, base assembly, and skid. The following paragraphs describe these components.

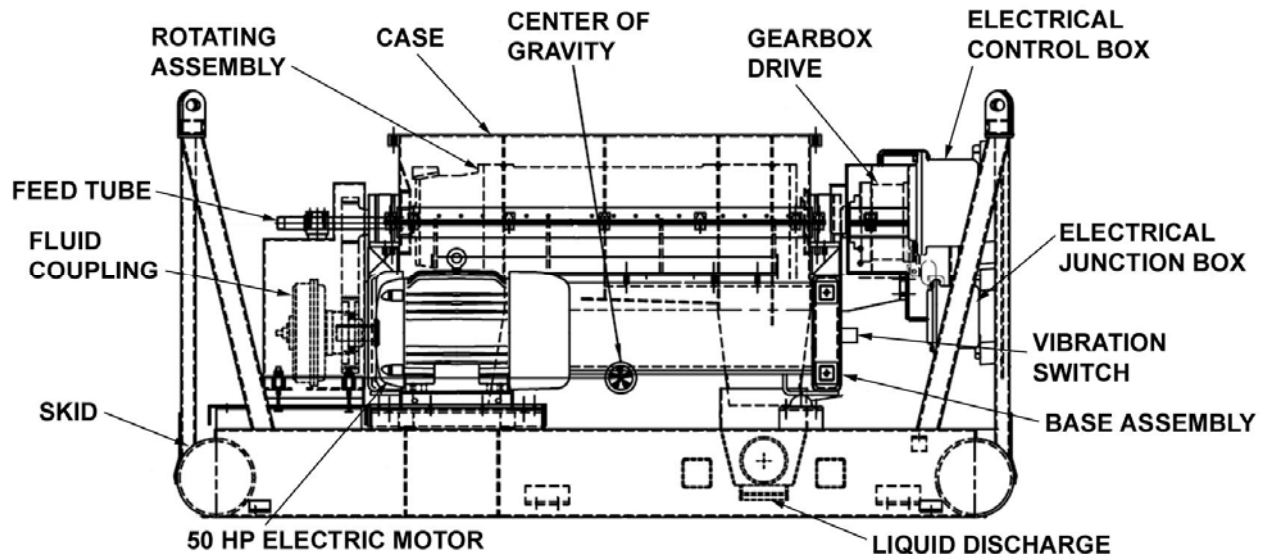


Figure 1120-2 Gearbox Drive (GBD) Centrifuge Major Components Location

Rotating Assembly

The rotating assembly consists of a cylindrically shaped stainless steel bowl, conveyor assembly, and related components. The bowl is a straight stainless steel cylinder with openings at both ends but with a conical head at the solids discharge end and a flat liquid bowl head at the opposite end. The bowl ends are supported by ball bearings having grease fittings to permit periodic lubrication.

Bowl Assembly

The liquid bowl head at the liquid discharge end contains movable weirs that permit manual adjustment of the liquid level remaining in the bowl during rotation. Index marks are provided on the weirs to facilitate precise adjustment. The liquid level or pond depth, along with other factors, helps determine the liquid content of the discharged solids. The tapered bowl extension at the solids end forms an upward sloping beach, where solids collect and are continuously discharged through the solids discharge outlet. The end of the bowl extension is closed by the solid bowl head, which has four openings to permit discharge of solids. Replaceable wear inserts installed in the solid bowl head protect the openings from wear.

Conveyor

The conveyor assembly is a hollow, cylindrical auger that receives the inlet slurry into its interior, disperses it through nozzles to the bowl assembly, and transports the solids to the solids discharge outlet. Rotated by a differential gearbox, the conveyor turns in the same direction but at a slower rate than the bowl. A drive shaft extending through the bowl head transfers motion from the gearbox to the conveyor. The feed tube inserted through the conveyor at the solids end directs inlet slurry against a feed accelerator, which rapidly disperses the material through feed nozzles in the conveyor. Carbide inserts are installed in the feed nozzles, and carbide tiles are welded to the edges of the conveyor flights for wear resistance. Ball bearings installed in pillow blocks having grease fittings support both ends of the conveyor.

Gearbox Drive

The gearbox drive is a differential reduction gearbox that rotates the conveyor at a slower speed than the bowl assembly. The gearbox, which is available in 52:1 or 125:1 ratios, consists of first- and second-stage planetary gear systems and a ring gear. The ring gear, which also forms the gearbox housing, is rotated through its attachment to the liquid bowl gear flange. The planetary gear system transfers rotation from the ring gear to the second-stage pinion gear, which turns the conveyor's splined output shaft.

The gearbox is cantilevered on the bowl assembly; one end is supported by the liquid end conveyor bearing and the other end is unsupported. The gearbox output shaft, driven by the second-stage planetary gears, engages internal splines in the conveyor to transmit rotary motion.

As with any differential gear system, rotation of one gear results when another gear is restrained from turning. For example, if the first-stage pinion is prevented from rotating, the ring gear will rotate. Conversely, restraining the ring gear results in pinion gear rotation. This characteristic protects the conveyor from damage due to an excessive feed rate or heavy material feed.

Due to its reduction gearing, the gearbox turns the conveyor at a proportionally lower rate than the bowl assembly. The conveyor's rotational speed varies directly with bowl speed, maintaining a consistent differential relationship for solids conveyance.

During an overload condition, the excessive solids in the conveyor may restrict its rotation, resulting in a corresponding speed reduction of the ring gear. If the conveyor's overload release torque limit is reached (52:1 gearbox - 335 in lbs; 125:1 gearbox - 200 in lbs), the first-stage pinion begins to rotate. Unless the over-torque condition is removed, the centrifuge will be shut down automatically.

Overload Release Assembly

If excessive torque is required to rotate the conveyor (335 in lbs - 52:1 gearbox; 200 in lbs - 125:1 gearbox), the overload release assembly (Figure 1120-3) shuts down electric power to the 50 HP drive motor to protect the conveyor from damage. The torque arm, which is suspended between stops, is attached to the clutch to prevent it from rotating with the gearbox ring gear. A roll pin keys the torque cam to the gearbox first-stage sun gear, which can rotate with the conveyor during excessive torque.

Excessive conveyor torque causes the first-stage sun gear to rotate, moving the cam sufficiently to move the roller arm, which opens the normally closed over-torque limit switch. The switch interrupts power to the 50 HP drive motor and feed pump motor, shutting down the centrifuge. After release, the clutch must be manually reset (refer to Section 5 - Maintenance) before the centrifuge can be returned to operation.

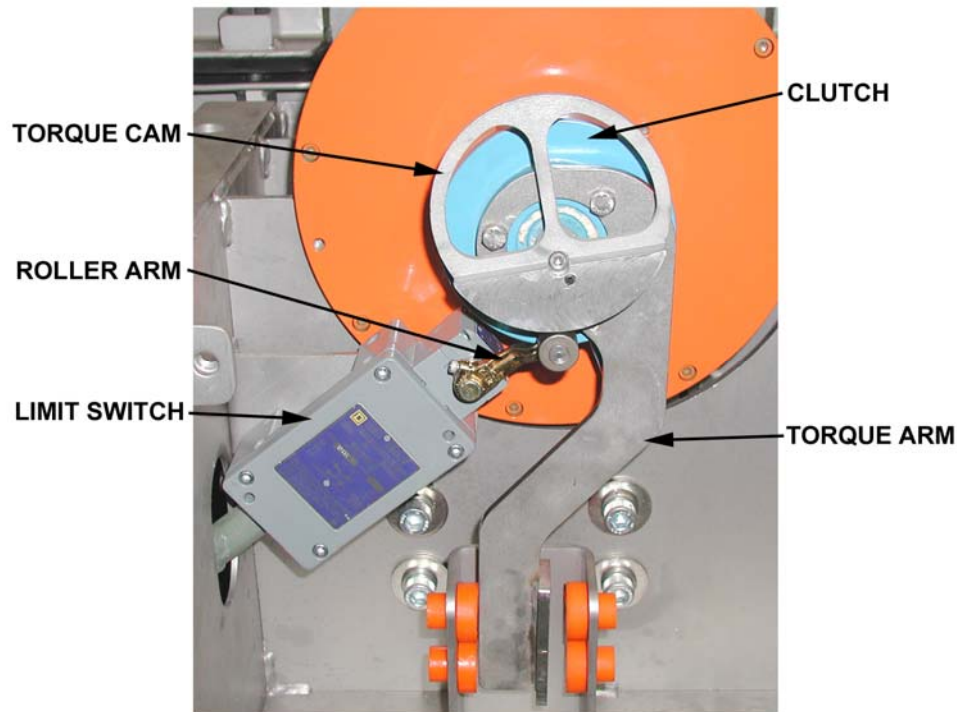


Figure 1120-3 Overload Release Assembly

FLUID COUPLING

The rotating assembly is driven by the 50 HP electric motor through the fluid coupling mounted on the motor shaft. Rotary motion of the motor shaft is transmitted to the inner hub of the fluid coupling. The outer hub of the coupling is connected to the sheave, which is rotated by the pressure of fluid contained within the coupling. Since the sheave is coupled to the motor shaft by a fluid coupling rather than a direct connection, the motor's rotation is cushioned, permitting the inertia of the rotating assembly to be overcome slowly, thereby allowing gradual, smooth acceleration of the bowl.

ELECTRICAL CONTROL BOX

The centrifuge is turned on and off at the electrical control box (Figure 1120-4). Components in the control box control operation of the 50 HP electric motor that drives the centrifuge rotating assembly and slurry feed pump. Control box components also shut down the motor and feed pump in case of an operational anomaly. The control box front panel contains an indicator that maintains an ongoing count of the number of centrifuge operating hours.

The CENTRIFUGE ON/OFF and PUMP ON/OFF switches are also included on the front panel. Each switch is split vertically, with the ON position at the left and OFF to the right. RESET buttons are provided to permit manual resetting of the centrifuge and pump run relays following a trip. Thermal overloads are built into the relays to shut down the centrifuge or feed pump motor in case of excessive current draw. The button mechanically depresses a reset button on its corresponding relay. Pressure switches shut down the feed pump when conveyor pressure demand reaches 1500 PSI and re-start the feed pump when pressure falls to 700 PSI.

ELECTRICAL CONTROL BOX (CONT'D)

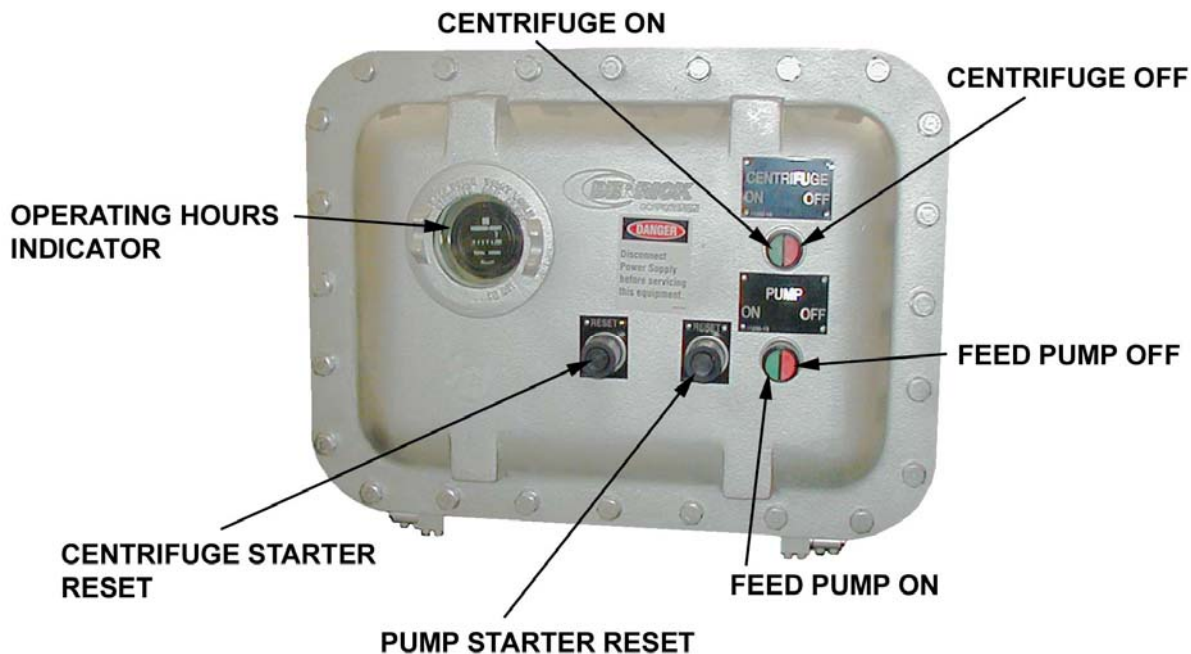


Figure 1120-4 Electrical Control Box

50 HP DRIVE MOTOR

The 50 HP, 460 Vac 60 Hz or 380 Vac 50 Hz, three-phase, explosion-proof electric motor is connected to the liquid bowl assembly by a sheave and drive belt. Motion is transmitted to the sheave by a fluid coupling, which is attached directly to the motor shaft. Protective guards cover the sheaves and drive belt for personnel protection.

The 60 Hz motor operates at 1760 RPM, and the 50 Hz unit operates at 1475 RPM. A temperature sensing element in the motor's stator winding causes the motor to shut down if the motor reaches an excessively high temperature.

VIBRATION SWITCH

The vibration switch (Figure 1120-5) is a safety device designed to protect personnel and equipment by shutting down the centrifuge in case of excessive vibration. Normally, the switch contacts are held closed by a mechanical latch. However, strong vibration or a shock of 2 Gs will overcome the magnetic latch, causing the switch armature to break away from the normally closed position, interrupting power to centrifuge run relay CR1. A reset button on the side of the switch must then be manually pressed to close the contacts and re-engage the magnetic latch. The vibration trip level is adjustable by means of a set point control, which adjusts the air gap between the magnet and latch arm plate. Turning the screw counterclockwise reduces the vibration set point in terms of G force needed to trip the armature. When the control is turned fully clockwise, the switch will trip at the maximum rated vibration level.

The vibration switch is mounted on the centrifuge frame in an orientation that is most affected by out-of-balance vibration of the bowl assembly. Clogging of the conveyor or worn bearings may produce sufficiently high vibration to trip the switch.

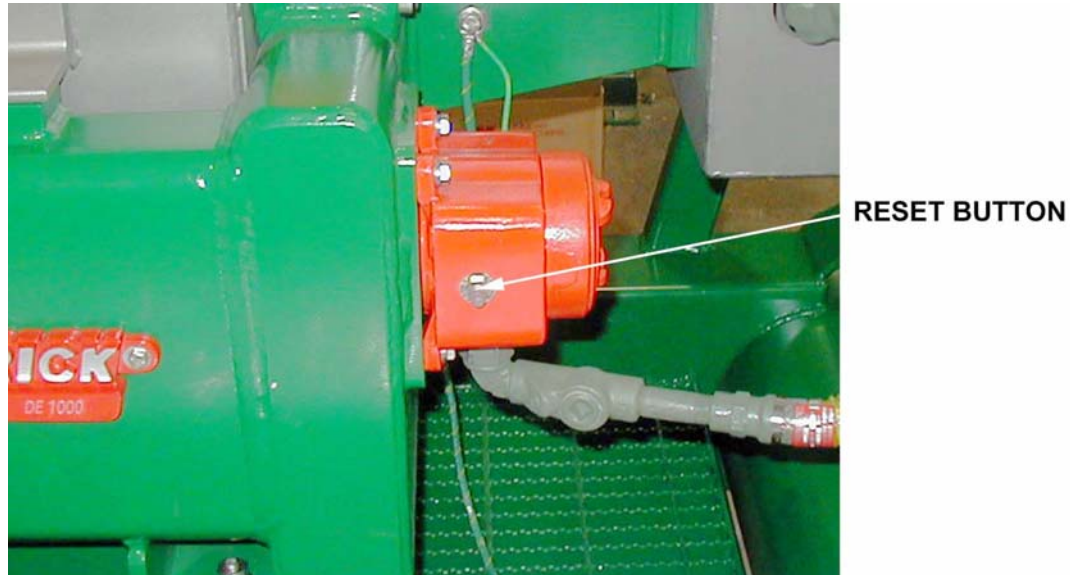


Figure 1120-5 Vibration Switch

CASE, BASE, AND SKID

The stainless steel upper and lower case halves provide a sealed, protective enclosure that fully surrounds the bowl assembly. The liquid discharge pipe and the solids discharge chute are installed at the bottom of the lower case half. Mating baffles installed inside the top and bottom case halves separate the solids and liquid. Bolts secure the top and bottom halves together, and a rubber gasket in the top case seals the two halves. A separate, two-piece enclosure is provided for the gearbox at the liquids end of the bowl assembly.

The case is bolted onto the welded steel base assembly, which contains mounting provisions for the bearing pillow blocks and feed tube support. The base assembly is bolted to the welded steel skid.

ELECTRICAL CONTROL SYSTEM OPERATION

The following paragraphs describe operation of the electrical control system. This information is provided as an aid to understanding the centrifuge operation, which will facilitate operating the equipment as well as for troubleshooting. The following paragraphs describe operation of the drive motor and feed pump control circuits.

50 HP Drive Motor

With electric power supplied to the centrifuge (refer to Drawing 10147-00 in Section 11), pressing the CENTRIFUGE ON button applies power through the switch's normally open (N/O) contacts, normally closed (N/C) thermal overload contacts, N/C over-torque switch contacts, N/C vibration switch contacts, and N/C motor over-temperature contacts, energizing centrifuge run relay CR1. With run relay CR1 energized, power is applied to the 50 HP electric drive motor. In addition, the feed pump circuit is enabled, permitting startup of the slurry feed pump, and the elapsed time meter is energized to begin recording operating time.

Feed Pump

Pressing the PUMP ON button applies power through the switch's N/O contacts and normally closed (N/C) thermal overload contacts, energizing pump start relay CR2. After the button is released, power is maintained to CR1 through the button's NC contacts, and the parallel circuit formed by the N/O contacts of relays CR1 and CR2. Pressing the PUMP OFF button de-energizes relay CR2, shutting down the feed pump motor and centrifuge drive motor.

Safety

The centrifuge control system protects the centrifuge in case of any of the following conditions:

- Excessive drive motor current demand
- Excessively high conveyor torque
- Excessive vibration
- Drive motor over-temperature

Any of these conditions de-energizes relay CR1, causing its N/O contacts to open, which de-energizes centrifuge run relay CR1, shutting down the 50 HP electric motor and feed pump motor, disabling the centrifuge. Once shut down by any of these conditions, the centrifuge cannot be re-started until the anomaly is removed, and the CENTRIFUGE ON button is pressed.

Thermal Overload

If the drive motor or pump feed motor thermal overload trips due to excessive current flow, the thermal overloads should be re-set and the centrifuge re-started only after removing the cause of the overload. Pressing the centrifuge and pump starter RESET buttons mechanically close the thermal overloads.

Vibration

Tripping the vibration switch due to excessive vibration of the centrifuge will also cause a shutdown, as the switch interrupts power flow to centrifuge run relay CR1. After removing the cause of unusual vibration, pressing the external button on the switch housing returns the switch contacts to the magnetically latched condition to restore power. The centrifuge is re-started by pressing the CENTRIFUGE ON button.

Motor Over-Temperature

The motor over-temperature switch interrupts power to run relay CR1 if the drive motor becomes excessively heated. After allowing the motor to cool and removing the cause of heating, the centrifuge is re-started by pressing the CENTRIFUGE ON button.

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EQUIPMENT SPECIFICATIONS

DE-1000 CENTRIFUGE - GEARBOX DRIVE

Equipment specifications are presented below for the DE-1000 gearbox drive (GBD) centrifuge. Refer to Section 11 - Reference Drawings for additional information and specifications.

Dimensions (Approx.)	115" L x 58-1/2" H x 75" W (2921mm x 1483mm x 1908mm)
Weight (Approx.)	6860 lbs (3118 kg)
Drive System	Bowl driven by a 50 HP electric motor operating through a fluid coupling with sheave and belt; conveyor driven by a differential reduction gearbox protected by an automatic overload release clutch
Bowl Speed	0 to 3400 RPM
Conveyor Speed	Automatically varies in proportion to bowl speed
Conveyor Differential Ratios	52:1 or 125:1
Overload Release Torque	52:1 - 335 In Lbs 125:1 - 200 In Lbs
Drive Motor	
Weight	743 lbs (1638 kg)
Type	50 HP, 380 Vac, 58 A, 50 Hz, 3 phase, 1450 RPM or 50 HP, 460 Vac, 71 A, 60 Hz, 3 phase, 1750 RPM, explosion-proof housing. For additional information, refer to the data plate on the motor case.

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Supersedes	25 May 07
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SERVICES & UTILITIES REQUIRED

DE-1000 CENTRIFUGE - GEARBOX DRIVE

GENERAL

To achieve optimum performance and reliability from your Derrick equipment, the services and utilities described below must be available at the installation site.

ELECTRIC POWER

For electrical service requirements, refer to the voltage label inside the electrical junction box. Also consult the data plate on the drive motor housing to verify power requirements. Refer to Section 11 - Reference Drawings for the wiring schematic that applies to the centrifuge.



WARNING! THE EQUIPMENT WILL BE DAMAGED BY INCORRECT ELECTRIC POWER. BE CERTAIN THAT POWER SUPPLIED TO THE EQUIPMENT IS THE CORRECT VOLTAGE AND FREQUENCY.

FEED PUMP

The customer must supply a positive-displacement feed pump of up to 15 HP for delivering slurry to the centrifuge. The pump must be connected to the centrifuge's electrical control system as described in DER03020 so that its operation can be supervised by the centrifuge.

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EQUIPMENT HANDLING PROCEDURES

DE-1000 CENTRIFUGE - GEARBOX DRIVE

RECEIVING THE EQUIPMENT

Immediately upon receipt of the Derrick equipment, examine contents for damaged and/or missing components. All equipment is sold FOB Derrick Corporation, Buffalo, New York. The transportation company signed a bill of lading at the time of shipment to indicate that all items were present and accounted for, and all items were in good condition at the time of shipment. The transportation company assumes responsibility for the equipment from that point forward. For proper handling of your claim, immediately report any loss or damage to the transportation company.

For material shortages not appearing on the bill of lading or for discrepancies between material ordered and material received, immediately notify Derrick Corporation.

MOVING/POSITIONING THE EQUIPMENT



WARNING! USE SPREADER BARS TO PREVENT DAMAGE WHEN LIFTING THE EQUIPMENT.



WARNING! TO ENSURE PROPER BALANCE AND ORIENTATION WHEN UNIT IS RAISED AND PREVENT DAMAGE TO COMPONENTS, ATTACH LIFTING SLINGS ONLY TO LABELLED LIFTING POINTS. DO NOT ATTEMPT LIFTING BY ATTACHMENT TO ANY OTHER LOCATION.



WARNING! BE SURE THAT HANDLING DEVICES HAVE SUFFICIENT LIFTING CAPACITY TO SAFELY HANDLE THE WEIGHT OF THE EQUIPMENT.



WARNING! DO NOT REMOVE SHIPPING BRACKETS UNTIL EQUIPMENT HAS BEEN POSITIONED AT FINAL INSTALLATION SITE.



WARNING! WHEN USING AN OVERHEAD LIFTING DEVICE, USE ALL FOUR LIFTING POINTS PROVIDED.

The centrifuge is shipped fully assembled and installed on a shipping skid. A label indicating the weight of the unit was affixed to the machine. Refer to Equipment Specifications [DER01220](#) for equipment weight and other technical data.

While the centrifuge is still mounted on the shipping skid, it may be transported on the ground using a forklift. After the machine is removed from the shipping skid, an overhead lifting device is required.

MOVING/POSITIONING THE EQUIPMENT (CONTINUED)

Four reinforced lifting lugs are built into the equipment frame to allow attachment of an overhead-lifting device (Figure 1220-1). Lifting points are labeled **“LIFT HERE ONLY”**. **DO NOT** attempt lifting equipment by attaching slings or similar lifting aids to the 50 HP electric motor or other non-designated portions of the unit. Use of spreader bars is recommended.

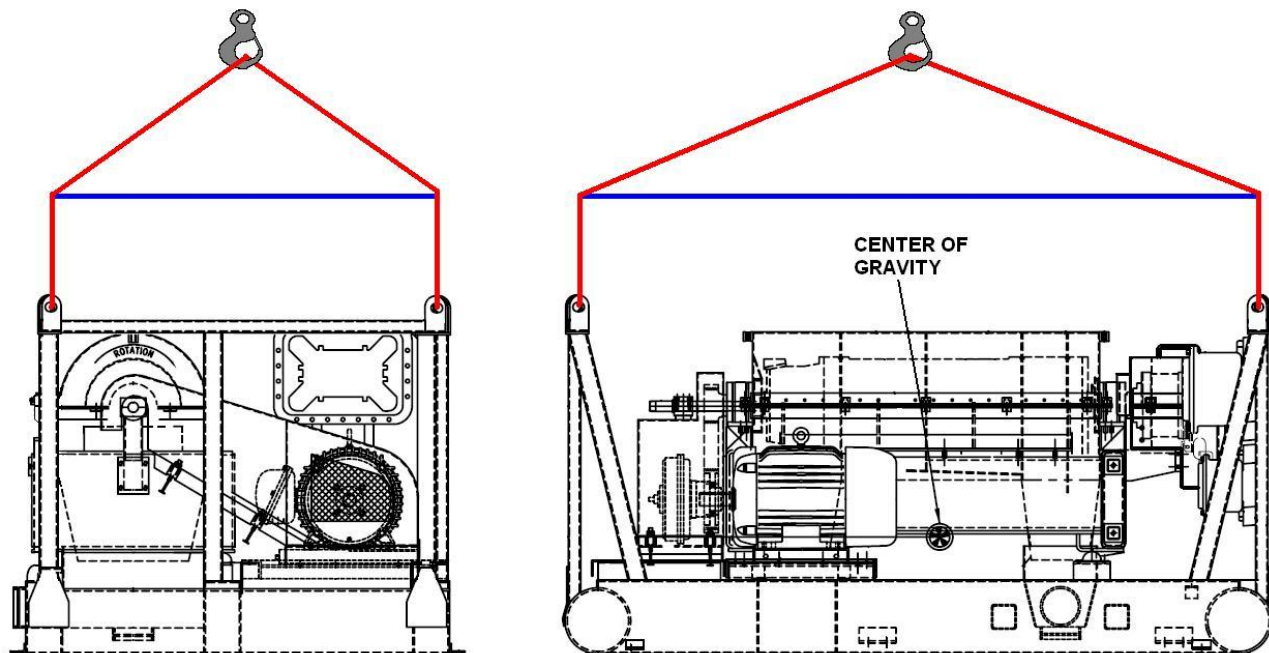


Figure 1220-1 Lifting Arrangement

EQUIPMENT STORAGE

General

If equipment is not being installed immediately, it should be stored in a dry environment (50 percent relative humidity or less). A dry environment will ensure that the machine remains in the same condition as when it was received.

If unit is stored outdoors, cover with a UV-resistant tarpaulin (tarp) or UV-resistant shrink-wrap. Install vents when using shrink-wrap. Cap exposed liquid discharge fitting and feed tube to prevent entry of moisture or foreign matter. Seal the Operating and Maintenance manual in plastic and attach to unit.



WARNING! MOTOR MAY BE DAMAGED BY STORING MACHINE IN A HIGH HUMIDITY ENVIRONMENT (GREATER THAN 50% RH). OUT-OF-SERVICE MOTOR(S) MUST BE STORED IN A LOW-HUMIDITY ENVIRONMENT.

Bearings

The main bearings that support the bowl assembly and the conveyor bearings should be lubricated before the centrifuge is placed in storage using the grease specified with the machine. For locations of lubrication points, refer to Section 5.

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WARNINGS SUMMARY

DE-1000 CENTRIFUGE - GEARBOX DRIVE

GENERAL

This section contains a summary of WARNINGS presented throughout the manual. The WARNINGS are grouped according to the following categories:

- Electrical Hazards
- Equipment Handling
- Operation
- Maintenance
- Storage

SOUND



WARNING! TO PROTECT AGAINST HEARING LOSS, HEARING PROTECTION SHOULD BE WORN AT ALL TIMES WHEN WORKING ON OR NEAR DERRICK MACHINES.

ELECTRICAL HAZARDS



WARNING! TO AVOID SERIOUS PERSONAL INJURY BE SURE EQUIPMENT IS LOCKED OUT, TAGGED OUT, DE-ENERGIZED, AND HAS STOPPED ROTATING BEFORE PERFORMING MAINTENANCE AND/OR ADJUSTMENTS.



WARNING! DRIVE MOTOR MUST BE OPERATED AT THE DESIGNATED SUPPLY VOLTAGE.







WARNING! HIGH VOLTAGE MAY BE PRESENT. BE SURE FUSED DISCONNECT SUPPLYING ELECTRIC POWER TO THIS EQUIPMENT IS OPEN. LOCK OUT AND TAG OUT POWER SUPPLY TO PREVENT ACCIDENTAL APPLICATION OF POWER WHILE MAINTENANCE AND/OR ADJUSTMENTS ARE IN PROGRESS.








WARNING! ELECTRICAL CONNECTIONS MUST BE MADE IN ACCORDANCE WITH THE NATIONAL ELECTRICAL CODE (NEC) AND ALL APPLICABLE LOCAL CODES. FAILURE TO COMPLY MAY RESULT IN AN UNSAFE CONDITION THAT COULD INJURE PERSONNEL OR DAMAGE EQUIPMENT. ENSURE THAT ALL ELECTRICAL AND CONDUIT CONNECTIONS ARE SECURE.

EQUIPMENT HANDLING

	WARNING! USE SPREADER BARS TO PREVENT DAMAGE WHEN LIFTING THE EQUIPMENT.
	WARNING! TO ENSURE PROPER BALANCE AND ORIENTATION WHEN UNIT IS RAISED AND PREVENT DAMAGE TO COMPONENTS, ATTACH LIFTING SLING ONLY AT DESIGNATED LIFT POINTS. DO NOT ATTEMPT LIFTING BY ATTACHMENT TO MOTOR OR ANY OTHER LOCATION.
	WARNING! BE SURE THAT HANDLING DEVICES HAVE SUFFICIENT LIFTING CAPACITY TO SAFELY HANDLE THE WEIGHT OF THE EQUIPMENT.
	WARNING! DO NOT REMOVE SHIPPING BRACKETS UNTIL EQUIPMENT HAS BEEN POSITIONED AT FINAL INSTALLATION SITE.

OPERATION

	WARNING! ALL OPERATING AND MAINTENANCE PERSONNEL MUST READ AND UNDERSTAND ALL SAFETY INFORMATION IN THIS MANUAL BEFORE WORKING WITH THE EQUIPMENT.
	WARNING! BE SURE THAT TOP COVER IS CLOSED AND SECURED AND ALL PERSONNEL ARE CLEAR BEFORE STARTING MACHINE.
	WARNING! BEFORE STARTING CENTRIFUGE, BE SURE THAT ALL SHIPPING BRACKETS HAVE BEEN REMOVED AND BEARING PILLOW BLOCKS ARE PROPERLY TIGHTENED.
	WARNING! ALWAYS ALLOW MACHINE TO COAST TO A COMPLETE STOP BEFORE OPENING TOP COVER OR REMOVING GUARDS.
	WARNING! DO NOT OPERATE CENTRIFUGE IF EXCESSIVE NOISE OR VIBRATION DEVELOPS. ALWAYS CONFIRM THAT VIBRATION SWITCH AND OTHER SAFETY DEVICES ARE FUNCTIONAL.

MAINTENANCE

WARNING! HIGH VOLTAGE MAY BE PRESENT. ALWAYS OPEN FUSED DISCONNECT SUPPLYING ELECTRIC POWER TO THE EQUIPMENT, AND LOCK OUT AND TAG OUT POWER SUPPLY BEFORE PERFORMING ANY MAINTENANCE AND/OR ADJUSTMENTS OF EQUIPMENT.

STORAGE

WARNING! CENTRIFUGE MAY BE DAMAGED BY STORING IN A HIGH HUMIDITY ENVIRONMENT (GREATER THAN 50% RH). EQUIPMENT MUST BE STORED IN A LOW-HUMIDITY ENVIRONMENT.

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MATERIAL SAFETY DATA SHEETS (MSDSs) DE-1000 CENTRIFUGE - GEARBOX DRIVE

Material Safety Data Sheets (MSDSs) for exterior finish products are included in this section to advise personnel of the properties and any possible hazards associated with these materials. Emergency first aid procedures, special precautions, emergency telephone number, and other relevant data are contained in the MSDSs. These documents were prepared by the product manufacturers, which have sole responsibility for accuracy of the information.

The MSDSs in this section are current as of the publication date of this manual and are supplied only for reference. Checking with the product manufacturer for updates is recommended and is the responsibility of the customer.

In addition to the MSDSs, manufacturer's specifications are listed for the lubricants and sealant used in the equipment. To ensure that current information is available, the MSDS for each product should be obtained at the time of purchase. Where more than one lubricant is listed for an application, all are equivalent and approved for lubrication requirements.

APPLICATION - DESCRIPTION	MSDS No. / Date
Paints	
Devco Devthane 359 - Top Coat	359 / 05-06-08
Devco Epoxy Primer - Undercoat	313K / 08-02-04
Lubricants	
<i>Arctic Environment</i>	
All Bearings - Shell Aeroshell GR-14	56200E-9 / 10-23-03*
Gearbox - Mobil SH 220	*
Fluid Coupling - Mobil SCH 626	*
Overload Release Clutch - Shell Aeroshell GR 14	56200E-9 / 10-23-03*
<i>Standard Environment</i>	
All Bearings - Chevron SRI NLGI 2	6979 / 08-03-04*
Gearbox - Shell Omala 320	*
Fluid Coupling - Chevron GST ISO-32	*
Overload Release Clutch - Shell Aeroshell GR 14	56200E-9 / 10-23-03*
<i>Food Grade</i>	
Main Bearings Only - Chevron SRI NLGI 2	6979 / 08-03-04*
Conveyor Bearings Only - Mobil FM 102	642363-00 / 01-17-02*
Sealant	
Loctite Anti-Seize Lubricant - Fasteners	76764 / 09-27-04*

* MSDS not included; contact manufacturer for latest revision.

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MATERIAL SAFETY DATA SHEET

prepared 05/06/08

ICI Paints North America

15885 Sprague Road Strongsville, Ohio 44136

EMERGENCY TELEPHONE NO. (800) 545-2643

DEVTHANE 359 DERRICK GREEN

359D

HAZARDS IDENTIFICATION (ANSI Section 3)

Primary route(s) of exposure : Inhalation, skin contact, eye contact, ingestion.

Effects of overexposure :

Inhalation : Irritation of respiratory tract. Prolonged inhalation may lead to. Inhalation of spray mist may cause irritation of respiratory tract. Mucous membrane irritation, fatigue, drowsiness, dizziness and/or lightheadedness, headache, uncoordination, nausea, vomiting, abdominal pain, chest pain, coughing, apathy, central nervous system depression, intoxication, anesthetic effect or narcosis, difficulty of breathing, allergic response, tremors, severe lung irritation or damage, pulmonary edema, pneumoconiosis, loss of consciousness, respiratory failure, death. Possible sensitization to respiratory tract.

Skin contact : Irritation of skin. Prolonged or repeated contact can cause dermatitis, defatting, severe skin irritation. Possible sensitization to skin.

Eye contact : Irritation of eyes. Prolonged or repeated contact can cause conjunctivitis, blurred vision, tearing of eyes, redness of eyes, severe eye irritation, corneal injury.

Ingestion : Ingestion may cause lung inflammation and damage due to aspiration of material into lungs, mouth and throat irritation, drowsiness, dizziness and/or lightheadedness, headache, uncoordination, nausea, vomiting, diarrhea, gastro-intestinal disturbances, abdominal pain, visual disturbances, apathy, central nervous system depression, intoxication, anesthetic effect or narcosis, burns of the mouth, throat, stomach, pulmonary edema, loss of consciousness, respiratory failure, death.

Medical conditions aggravated by exposure : Eye, skin, respiratory disorders, kidney disorders, liver disorders, nervous system disorders, respiratory disorders.

FIRST-AID MEASURES (ANSI Section 4)

Inhalation : Remove to fresh air. Restore and support continued breathing. Get emergency medical attention. Have trained person give oxygen if necessary. Get medical help for any breathing difficulty. Remove to fresh air if inhalation causes eye watering, headaches, dizziness, or other discomfort.

Skin contact : Wash thoroughly with soap and water. If any product remains, gently rub petroleum jelly, vegetable or mineral/baby oil onto skin. Repeated applications may be needed. Remove contaminated clothing. Wash contaminated clothing before re-use. Dispose of contaminated leather items, such as shoes and belts. If irritation occurs, consult a physician.

Eye contact : Flush immediately with large amounts of water, especially under lids for at least 15 minutes. If irritation or other effects persist, obtain medical treatment.

Ingestion : If swallowed, obtain medical treatment immediately.

FIRE-FIGHTING MEASURES (ANSI Section 5)

Fire extinguishing media : Dry chemical or foam water fog. Carbon dioxide. Closed containers may explode when exposed to extreme heat or fire. Vapors may ignite explosively at ambient temperatures. Vapors are heavier than air and may travel long distances to a source of ignition and flash back. Vapors can form explosive mixtures in air at elevated temperatures. Closed containers may burst if exposed to extreme heat or fire. Dust explosion hazard. May decompose under fire conditions emitting irritant and/or toxic gases.

Fire fighting procedures : Water may be used to cool and protect exposed containers. Firefighters should use full protective clothing, eye protection, and self-contained breathing apparatus. Self-contained breathing apparatus recommended.

Hazardous decomposition or combustion products : Carbon monoxide, carbon dioxide, oxides of nitrogen, oxides of sulfur, ammonia, hydrogen chloride, toxic gases, barium compounds. Cyanides.

ACCIDENTAL RELEASE MEASURES (ANSI Section 6)

Steps to be taken in case material is released or spilled : Comply with all applicable health and environmental regulations. Eliminate all sources of ignition. Ventilate area. Ventilate area with explosion-proof equipment. Spills may be collected with absorbent materials. Use non-sparking tools. Evacuate all unnecessary personnel. Place collected material in proper container. Complete personal protective equipment must be used during cleanup. Large spills - shut off leak if safe to do so. Dike and contain spill. Pump to storage or salvage vessels. Use absorbent to pick up excess residue. Keep salvageable material and rinse water out of sewers and water courses. Small spills - use absorbent to pick up residue and dispose of properly.

HANDLING AND STORAGE (ANSI Section 7)

Handling and storage : Store below 80f. Store below 100f (38c). Keep away from heat, sparks and open flame. Store in original container. Keep away from direct sunlight, heat and all sources of ignition. Keep container tightly closed in a well-ventilated area.

Other precautions : Use only with adequate ventilation. Do not take internally. Keep out of reach of children. Avoid contact with skin and eyes, and breathing of vapors. Wash hands thoroughly after handling, especially before eating or smoking. Keep containers tightly closed and upright when not in use. Empty containers may contain hazardous residues. Ground equipment when transferring to prevent accumulation of static charge.

EXPOSURE CONTROLS/PERSONAL PROTECTION (ANSI Section 8)

Respiratory protection : Respiratory protection is required for use in isocyanate containing environments. Consider type of application and environmental concentrations when selecting respiratory protection. Observe governmental regulations for respirator use. (29 CFR 1910.134(OSHA))(Canadian z94.4) The use of positive pressure supplied air respirator is mandatory when the airborne isocyanate concentrations are not known. Note: isocyanate based materials have been determined to cause allergic sensitization in humans. Avoid inhalation and dermal (skin) contact with the uncured material.

Ventilation : Provide dilution ventilation or local exhaust to prevent build-up of vapors. Use explosion-proof equipment. Use non-sparking equipment.

Personal protective equipment : Eye wash, safety shower, safety glasses or goggles. Impervious gloves, impervious clothing, face shield, apron, boots.

STABILITY AND REACTIVITY (ANSI Section 10)

Under normal conditions : Stable see section 5 fire fighting measures

Materials to avoid : Oxidizers, acids, reducing agents, bases, aldehydes, halogens, amines, alkalis, water, peroxides, nitric acid, alcohols, combustible materials, caustics, mineral acids. Nitrates.

Conditions to avoid : Sunlight, elevated temperatures, moisture, contact with oxidizing agent, storage near acids, sparks, open flame, ignition sources.

Hazardous polymerization : Will not occur

(ANSI Section 11)

Carcinogenicity : Contains formaldehyde, a potential cancer hazard. Rats exposed to formaldehyde via inhalation developed cancer of the nasal cavity. Evidence in humans is limited (nasal and nasopharyngeal cancer). Formaldehyde is listed as a carcinogen by OSHA, probable human carcinogen (group 2a) by IARC, and anticipated human carcinogen by NTP. Overexposure can cause eye, skin, and respiratory tract irritation, and skin and respiratory sensitization. In a lifetime inhalation study, exposure to 250 mg/m³ titanium dioxide resulted in the development of lung tumors in rats. These tumors occurred only at dust levels that overwhelmed the animals' lung clearance mechanisms and were different from common human lung tumors in both type and location. The relevance of these findings to humans is unknown but questionable. The international agency for research on cancer (IARC) has classified titanium dioxide as possibly carcinogenic to humans (group 2b) based on inadequate evidence of carcinogenicity in humans and sufficient evidence of carcinogenicity in experimental animals.

Teratogenicity : No teratogenic effects are anticipated

(ANSI Section 12)

No ecological testing has been done by ICI paints on this product as a whole.

(ANSI Section 13)

Waste disposal : Dispose in accordance with all applicable regulations. Avoid discharge to natural waters.

(ANSI Section 15)

As of the date of this MSDS, all of the components in this product are listed (or are otherwise exempt from listing) on the TSCA inventory. This product has been classified in accordance with the hazard criteria of the CPR (controlled products regulations) and the MSDS contains all the information required by the CPR.

(ANSI Sections 1, 9, and 14)

Product Code	Description	Wt. / Gal.	VOC gr. / ltr.	% Volatile by Volume	Flash Point	Boiling Range	HMIS	DOT, proper shipping name
359F65DGF	devthane 359h (no organic haps) derrick green	9.02	291.43	34.96	80 f	208-595	*330	UN1263, paint, 3, PGIII
379C0910	devthane 379 hs converter	9.40	112.85	13.00	135 f	293-293	*321	UN1866, resin solution, combustible liquid, PGIII

Product Codes with % by Weight (ANSI Section 2)

Chemical Name	Common Name	CAS. No.	359F65DGF	379C0910
4-heptanone, 2,6-dimethyl-	diisobutyl ketone	108-83-8	1-5	
ethane, 1,1',1''-methylidenetris(oxy)-tris-acetic acid, butyl ester	ethyl orthoformate	122-51-0	1-5	
c.i. pigment green 7	butyl acetate	123-86-4	5-10	5-10
benzene, dimethyl-	phthalo green pigment	1328-53-6	1-5	
titanium oxide	xylene	1330-20-7	.1-1.0	.1-1.0
2-propenoic acid, 2-methyl-, 2-hydroxyethyl ester, polymer with ethenylbenzene, 2-ethylhexyl 2-propeno and methyl 2-methyl-2-propenoate	titanium dioxide	13463-67-7	1-5	
hexane, 1,6-diisocyanato-, homopolymer	acrylic polymer	26916-05-2	40-50	
formaldehyde	aliphatic polyisocyanate	28182-81-2		90-95
c.i. pigment yellow 42	formaldehyde	50-00-0	LT .01	
acetic acid, 1,1-dimethylethyl ester	yellow iron oxide	51274-00-1	1-5	
butanamide, 2-((2-methoxy-4-nitrophenyl)azo) -n-(2-methoxyphenyl)-3-oxo-	tert-butyl acetate	540-88-5	1-5	
solvent naphtha (petroleum), light aromatic	pigment yellow 74	6358-31-2	1-5	
1-butanol	light aromatic solvent naphtha	64742-95-6		1-5
propanoic acid, 3-ethoxy-, ethyl ester	n-butanol	71-36-3	1-5	
sulfuric acid, barium salt	ethyl 3-ethoxypropionate	763-69-9	5-10	
castor oil	barium sulfate	7727-43-7	1-5	
hexane, 1,6-diisocyanato-	castor oil, raw	8001-79-4	10-20	
acetic acid, c6-8-branched alkyl esters	hexamethylene diisocyanate	822-06-0		.1-1.0
benzene,1,2,4-trimethyl-	oxo-heptyl acetate	90438-79-2	1-5	
anti-settling agent	pseudocumene	95-63-6	.1-1.0	1-5
polyamide	anti-settling agent	Sup. Conf.	1-5	
	rheological additive	Sup. Conf.	1-5	

Chemical Hazard Data (ANSI Sections 2, 8, 11, and 15)

Common Name	CAS. No.	ACGIH-TLV				OSHA-PEL				S.R. Std.	S2	S3	CC	H	M	N	I	O
		8-Hour TWA	STEL	C	S	8-Hour TWA	STEL	C	S									
diisobutyl ketone	108-83-8	25 ppm	not est.	not est.	not est.	50 ppm	not est.	not est.	not est.	not est.	n	n	n	n	n	n	n	n
ethyl orthoformate	122-51-0	not est.	not est.	not est.	not est.	not est.	not est.	not est.	not est.	not est.	n	n	n	n	n	n	n	n
butyl acetate	123-86-4	150 ppm	200 ppm	not est.	not est.	150 ppm	not est.	not est.	not est.	not est.	n	n	y	n	n	n	n	n
phthalo green pigment	1328-53-6	not est.	not est.	not est.	not est.	not est.	not est.	not est.	not est.	not est.	n	n	n	n	n	n	n	n
xylene	1330-20-7	100 ppm	150 ppm	not est.	not est.	100 ppm	not est.	not est.	not est.	not est.	n	y	y	y	n	n	n	n
titanium dioxide	13463-67-7	10 mg/m3	not est.	not est.	not est.	10 mg/m3	not est.	not est.	not est.	not est.	n	n	n	n	n	y	y	n
acrylic polymer	26916-05-2	not est.	not est.	not est.	not est.	not est.	not est.	not est.	not est.	not est.	n	n	n	n	n	n	n	n
aliphatic polyisocyanate	28182-81-2	not est.	not est.	not est.	not est.	not est.	not est.	not est.	not est.	not est.	n	n	n	n	n	n	n	n
formaldehyde	50-00-0	not est.	not est.	0.3 ppm	not est.	0.75 ppm	2 ppm	not est.	not est.	not est.	y	y	y	y	n	y	y	y
yellow iron oxide	51274-00-1	5 mg/m3	not est.	not est.	not est.	10 mg/m3	not est.	not est.	not est.	not est.	n	n	n	n	n	n	n	n
tert-butyl acetate	540-88-5	200 ppm	not est.	not est.	not est.	200 ppm	not est.	not est.	not est.	not est.	n	n	y	n	n	n	n	n
pigment yellow 74	6358-31-2	not est.	not est.	not est.	not est.	not est.	not est.	not est.	not est.	not est.	n	n	n	n	n	n	n	n
light aromatic solvent naphtha	64742-95-6	not est.	not est.	not est.	not est.	500x ppm	not est.	not est.	not est.	not est.	n	n	n	n	n	n	n	n
n-butanol	71-36-3	20 ppm	not est.	not est.	not est.	100 ppm	not est.	not est.	not est.	not est.	n	y	y	n	n	n	n	n
ethyl 3-ethoxypropionate	763-69-9	not est.	not est.	not est.	not est.	not est.	not est.	not est.	not est.	not est.	n	n	n	n	n	n	n	n
barium sulfate	7727-43-7	10 mg/m3	not est.	not est.	not est.	5 mg/m3	not est.	not est.	not est.	not est.	n	n	n	n	n	n	n	n
castor oil, raw	8001-79-4	not est.	not est.	not est.	not est.	not est.	not est.	not est.	not est.	not est.	n	n	n	n	n	n	n	n
hexamethylene diisocyanate	822-06-0	0.005 ppm	not est.	not est.	not est.	not est.	not est.	not est.	not est.	not est.	n	y	y	y	n	n	n	n
oxo-heptyl acetate	90438-79-2	not est.	not est.	not est.	not est.	not est.	not est.	not est.	not est.	not est.	n	n	n	n	n	n	n	n
pseudocumene	95-63-6	25 ppm	not est.	not est.	not est.	not est.	not est.	not est.	not est.	not est.	n	y	n	n	n	n	n	n
anti-settling agent	Sup. Conf.	not est.	not est.	not est.	not est.	not est.	not est.	not est.	not est.	not est.	n	n	n	n	n	n	n	n
rheological additive	Sup. Conf.	10 mg/m3	not est.	not est.	not est.	5 mg/m3	not est.	not est.	not est.	not est.	n	n	n	n	n	n	n	n

Footnotes:

C=Ceiling - Concentration that should not be exceeded, even instantaneously.

S=Skin - Additional exposure, over and above airborne exposure, may result from skin absorption.

n/a=not applicable
not est.=not established
CC=CERCLA Chemical

ppm=parts per million
mg/m3=milligrams per cubic meter
Sup Conf=Supplier Confidential

S2=Sara Section 302 EHS
S3=Sara Section 313 Chemical
S.R.Std.=Supplier Recommended Standard

H=Hazardous Air Pollutant, M=Marine Pollutant
P=Pollutant, S=Severe Pollutant
Carcinogenicity Listed By:
N=NTP, I=IARC, O=OSHA, y=yes, n=no

HAZARDS IDENTIFICATION

(ANSI Section 3)

Primary route(s) of exposure : Inhalation, skin contact, eye contact, ingestion.

Effects of overexposure :

Inhalation : Irritation of respiratory tract. Prolonged inhalation may lead to mucous membrane irritation, fatigue, drowsiness, dizziness and/or lightheadedness, headache, uncoordination, nausea, vomiting, diarrhea, abdominal pain, chest pain, blurred vision, flu-like symptoms, coughing, sneezing, difficulty with speech, apathy, central nervous system depression, anesthetic effect or narcosis, difficulty of breathing, allergic response, fever and chills, tremors, abnormal blood pressure, severe lung irritation or damage, liver damage, kidney damage, pulmonary edema, pneumoconiosis, loss of consciousness, respiratory failure, asphyxiation, death. Possible sensitization to respiratory tract.

Skin contact : Irritation of skin. Prolonged or repeated contact can cause dermatitis, defatting, blistering, allergic response, severe skin irritation, severe skin irritation or burns. Possible sensitization to skin.

Eye contact : Irritation of eyes. Prolonged or repeated contact can cause conjunctivitis, blurred vision, tearing of eyes, redness of eyes, severe eye irritation, severe eye irritation or burns, corneal injury.

Ingestion : Ingestion may cause lung inflammation and damage due to aspiration of material into lungs, mouth and throat irritation, drowsiness, dizziness and/or lightheadedness, headache, uncoordination, nausea, vomiting, diarrhea, gastro-intestinal disturbances, abdominal pain, visual disturbances, apathy, central nervous system depression, anesthetic effect or narcosis, burns of the mouth, throat, stomach, liver damage, kidney damage, pulmonary edema, loss of consciousness, respiratory failure, death.

Medical conditions aggravated by exposure : Eye, skin, respiratory disorders, lung disorders, asthma-like conditions, respiratory disorders.

FIRST-AID MEASURES

(ANSI Section 4)

Inhalation : Remove to fresh air. Restore and support continued breathing. Get emergency medical attention. Have trained person give oxygen if necessary. Get medical help for any breathing difficulty.

Skin contact : Wash thoroughly with soap and water. If any product remains, gently rub petroleum jelly, vegetable or mineral/baby oil onto skin. Repeated applications may be needed. Remove contaminated clothing. Wash contaminated clothing before re-use. Dispose of contaminated leather items, such as shoes and belts. If irritation occurs, consult a physician.

Eye contact : Flush immediately with large amounts of water, especially under lids for at least 15 minutes. If irritation or other effects persist, obtain medical treatment.

Ingestion : If swallowed, obtain medical treatment immediately.

FIRE-FIGHTING MEASURES

(ANSI Section 5)

Fire extinguishing media : Dry chemical or foam water fog. Carbon dioxide. Closed containers may explode when exposed to extreme heat or fire. Vapors may ignite explosively at ambient temperatures. Vapors are heavier than air and may travel long distances to a source of ignition and flash back. Vapors can form explosive mixtures in air at elevated temperatures. Closed containers may burst if exposed to extreme heat or fire. May decompose under fire conditions emitting irritant and/or toxic gases.

Fire fighting procedures : Water may be used to cool and protect exposed containers. Firefighters should use full protective clothing, eye protection, and self-contained breathing apparatus. Self-contained breathing apparatus recommended.

Hazardous decomposition or combustion products : Carbon monoxide, carbon dioxide, oxides of nitrogen, oxides of sulfur, ammonia, aldehydes, toxic gases, barium compounds. Cyanides.

ACCIDENTAL RELEASE MEASURES

(ANSI Section 6)

Steps to be taken in case material is released or spilled : Comply with all applicable health and environmental regulations. Eliminate all sources of ignition. Ventilate area. Ventilate area with explosion-proof equipment. Spills may be collected with absorbent materials. Use non-sparking tools. Evacuate all unnecessary personnel. Place collected material in proper container. Complete personal protective equipment must be used during cleanup. Large spills - shut off leak if safe to do so. Dike and contain spill. Pump to storage or salvage vessels. Use absorbent to pick up excess residue. Keep salvageable material and rinse water out of sewers and water courses. Small spills - use absorbent to pick up residue and dispose of properly.

HANDLING AND STORAGE

(ANSI Section 7)

Handling and storage : Store below 80f. Store below 100f (38c). Keep away from heat, sparks and open flame. Keep away from direct sunlight, heat and all sources of ignition.

Other precautions : Use only with adequate ventilation. Do not take internally. Keep out of reach of children. Avoid contact with skin and eyes, and breathing of vapors. Wash hands thoroughly after handling, especially before eating or smoking. Keep containers tightly closed and upright when not in use. Empty containers may contain hazardous residues. Ground equipment when transferring to prevent accumulation of static charge.

EXPOSURE CONTROLS/PERSONAL PROTECTION

(ANSI Section 8)

Respiratory protection : Control environmental concentrations below applicable exposure standards when using this material. When respiratory protection is determined to be necessary, use a NIOSH/MSHA (Canadian z94.4) Approved elastomeric sealing- surface facepiece respirator outfitted with organic vapor cartridges and paint spray (dust/mist) prefilters. Determine the proper level of protection by conducting appropriate air monitoring. Consult 29CFR1910.134 For selection of respirators (Canadian z94.4).

Ventilation : Provide dilution ventilation or local exhaust to prevent build-up of vapors. Use explosion-proof equipment. Use non-sparking equipment.

Personal protective equipment : Eye wash, safety shower, safety glasses or goggles. Impervious gloves, impervious clothing, face shield, apron.

STABILITY AND REACTIVITY

(ANSI Section 10)

Under normal conditions : Stable see section 5 fire fighting measures

Materials to avoid : Oxidizers, acids, reducing agents, bases, aldehydes, ketones, halogens, amines, carbon tetrachloride (at elevated temperatures), aluminum, nitric acid, metal compounds, lewis acids, mineral acids.

Conditions to avoid : Elevated temperatures, moisture, contact with oxidizing agent, storage near acids, sparks, open flame, ignition sources.

Hazardous polymerization : Will not occur may polymerize in presence of aliphatic amines.

TOXICOLOGICAL INFORMATION

(ANSI Section 11)

Supplemental health information : Contains a chemical that is moderately toxic by ingestion. Contains a chemical that may be absorbed through skin. Excessive inhalation of fumes may lead to metal fume fever characterized by a metallic taste in mouth, excessive thirst, coughing, weakness, fatigue, muscular pain, nausea, chills and fever. Notice - reports have associated repeated and prolonged occupational overexposure to solvents with permanent brain and nervous system damage. Intentional misuse by deliberately concentrating and inhaling the contents may be harmful or fatal. Other effects of overexposure may include toxicity to liver, kidney, central nervous system, blood.

Carcinogenicity : The international agency for research on cancer (IARC) has evaluated ethylbenzene and classified it as a possible human carcinogen (group 2b) based on sufficient evidence for carcinogenicity in experimental animals, but inadequate evidence for cancer in exposed humans. In a 2 year inhalation study conducted by the national toxicology program (NTP), ethylbenzene vapor at 750 ppm produced kidney and testicular tumors in rats and lung and liver tumors in mice. Genetic toxicity studies showed no genotoxic effects. The relevance of these results to humans is not known.

Reproductive effects : High exposures to xylene in some animal studies, often at maternally toxic levels, have affected embryo/fetal development. The significance of this finding to humans is not known.

Mutagenicity : Triethylenetetramine has demonstrated weak mutagenic activity in standard in vitro tests, and has caused embryo- fetal toxicity and fetal malformations when fed to rats. Triethylenetetramine did not exhibit carcinogenic potential in life-time mouse skin painting studies.

Teratogenicity : No teratogenic effects are anticipated

Physical Data

(ANSI Sections 1, 9, and 14)

Product Code	Description	Wt. / Gal.	VOC gr. / ltr.	% Volatile by Volume	Flash Point	Boiling Range	HMIS	DOT, proper shipping name
313B0250	do not use, use dc313b0250d instead	24.77	334.95	41.44	90 f	244-304	*231	paint, 3, UN1263, PGIII
313C0910	catha coat 313 organic zinc-rich epoxy primer clear converter	7.54	338.66	41.11	110 f	243-304	*320	paint, combustible liquid, UN 1263, PGIII

Ingredients

Product Codes with % by Weight (ANSI Section 2)

Chemical Name	Common Name	CAS. No.	313B0250	313C0910
benzene, ethyl-	ethylbenzene	100-41-4	.1-1.0	
2-heptanone	methyl amyl ketone	110-43-0	5-10	20-30
1,2,-ethanediamine, n,n'-bis(2-aminoethyl)-	triethylenetetramine	112-24-3		1-5
zinc oxide	zinc oxide	1314-13-2	1-5	
benzene, dimethyl-	xylene	1330-20-7	1-5	
oxirane,2,2'-((1-methylethylidene) bis (4,1-phenyleneoxymethylene))) bis-	diglycidyl ether of bisphenol a	1675-54-3	1-5	
phenol, 4,4'-(1-methylethylidene)bis-, polymer with 2,2'-((1-methylethylidene)bis (4,1-phenyleneoxymethylene))bis(oxirane)	epoxy resin	25036-25-3	1-5	
fatty acids, c18-unsatd., dimers, reaction products with polyethylenepolyamines	polyamide resin	68410-23-1		40-50
1-butanol	n-butanol	71-36-3		10-20
zinc	zinc	7440-66-6	70-80	
sulfuric acid, barium salt	barium sulfate	7727-43-7	1-5	
amine adduct	amine adduct	Sup. Conf.		10-20

Chemical Hazard Data

(ANSI Sections 2, 8, 11, and 15)

		ACGIH-TLV				OSHA-PEL				S.R. Std.	S2	S3	CC						
Common Name	CAS. No.	8-Hour TWA	STEL	C	S	8-Hour TWA	STEL	C	S					H	M	N	I	O	
ethylbenzene	100-41-4	100 ppm	125 ppm	not est.	not est.	100 ppm	not est.	not est.	not est.	not est.	n	y	y	y	n	n	y	n	
methyl amyl ketone	110-43-0	50 ppm	not est.	not est.	not est.	100 ppm	not est.	not est.	not est.	not est.	n	n	n	n	n	n	n	n	
triethylenetetramine	112-24-3	not est.	not est.	not est.	not est.	not est.	not est.	not est.	not est.	not est.	n	n	n	n	n	n	n	n	
zinc oxide	1314-13-2	2 mg/m3	10 mg/m3	not est.	not est.	5 mg/m3	not est.	not est.	not est.	not est.	n	y	n	n	n	n	n	n	
xylene	1330-20-7	100 ppm	150 ppm	not est.	not est.	100 ppm	not est.	not est.	not est.	not est.	n	y	y	y	n	n	n	n	
diglycidyl ether of bisphenol a	1675-54-3	not est.	not est.	not est.	not est.	not est.	not est.	not est.	not est.	not est.	n	n	n	n	n	n	n	n	
epoxy resin	25036-25-3	not est.	not est.	not est.	not est.	not est.	not est.	not est.	not est.	not est.	n	n	n	n	n	n	n	n	
polyamide resin	68410-23-1	not est.	not est.	not est.	not est.	not est.	not est.	not est.	not est.	not est.	n	n	n	n	n	n	n	n	
n-butanol	71-36-3	20 ppm	not est.	not est.	not est.	100 ppm	not est.	not est.	not est.	not est.	n	y	y	n	n	n	n	n	
zinc	7440-66-6	not est.	not est.	not est.	not est.	not est.	not est.	not est.	not est.	not est.	n	y	y	n	n	n	n	n	
barium sulfate	7727-43-7	10 mg/m3	not est.	not est.	not est.	5 mg/m3	not est.	not est.	not est.	not est.	n	n	n	n	n	n	n	n	
amine adduct	Sup. Conf.	not est.	not est.	not est.	not est.	not est.	not est.	not est.	not est.	not est.	n	n	n	n	n	n	n	n	

Footnotes:

C=Ceiling - Concentration that should not be exceeded, even instantaneously.

S=Skin - Additional exposure, over and above airborne exposure, may result from skin absorption.

n/a=not applicable

not est=not established

CC=CERCLA Chemical

ppm=parts per million

mg/m3=milligrams per cubic meter

Sup Conf=Supplier Confidential

S2=Sara Section 302 EHS

S3=Sara Section 313 Chemical

S.R.Std.=Supplier Recommended Standard

H=Hazardous Air Pollutant, M=Marine Pollutant

P=Pollutant, S=Severe Pollutant

Carcinogenicity Listed By:

N=NTP, I=IARC, O=OSHA, y=yes, n=no



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Supersedes 25 May 07
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INSTALLATION INSTRUCTIONS

DE-1000 CENTRIFUGE - GEARBOX DRIVE

GENERAL

This section describes the recommended installation procedure for the Derrick equipment defined by the model number and drawing number associated with your equipment. The centrifuge is shipped fully assembled, except for the rotating assembly. For safety during shipment, this assembly is supported by shipping blocks. It must be lowered onto the base and then its bearing pillow blocks secured to the base.

SAFETY

Read and understand **ALL** safety information presented in this manual **before** installing and operating this equipment. Refer to Section 2 for a summary of Warnings addressing installation, operation, and maintenance of this equipment.

Before beginning the installation, review the information presented in DER01420 in Equipment Handling Procedures in Section 1. Pay particular attention to information concerning lift points and the use of spreader bars before lifting or moving the equipment.

Failure to observe proper equipment handling procedures may result in serious personal injury or death and/or damage to the equipment.



WARNING! TO ENSURE PROPER BALANCE AND ORIENTATION WHEN UNIT IS RAISED AND PREVENT DAMAGE TO COMPONENTS, ATTACH LIFTING SLING ONLY AT DESIGNATED LIFT POINTS. DO NOT ATTEMPT LIFTING BY ATTACHMENT TO ANY OTHER LOCATION.



WARNING! BE SURE THAT HANDLING DEVICES HAVE SUFFICIENT LIFTING CAPACITY TO SAFELY HANDLE THE WEIGHT OF THE EQUIPMENT. LOWER THE CENTRIFUGE GENTLY INTO PLACE, AS JARRING MAY CAUSE DAMAGE.



WARNING! DO NOT REMOVE SHIPPING BRACKETS UNTIL CENTRIFUGE HAS BEEN POSITIONED AT FINAL INSTALLATION SITE.

INSTALLATION SEQUENCE

Following is the sequence of steps for installing the centrifuge. The sequence presented may vary depending on the user's facilities and previous experience with this type of equipment.

1. Read and understand all safety information in Warnings Summary DER02020 in Section 2 before installing and operating this equipment.
2. Read and understand the Equipment Handling Procedures DER01420 in Section 1 before lifting and moving the equipment.
3. Position and level equipment at installation site.
4. Remove shipping brackets, and lower and secure the rotating assembly to the base.
5. Adjust drive belt (refer to Adjustments, DER05104).
6. Connect liquid discharge line.
7. If discharge duct is to be used, connect duct to solids discharge chute.
8. Install feed tube, and connect flexible feed line to feed tube.
9. Connect electric power supply to the equipment, and connect feed pump to centrifuge control circuit.
10. Refer to Section 4 - Operating Instructions DER04097 for startup and operating procedures.

REQUIRED CLEARANCES AND POSITIONING

Sufficient space should be provided around the equipment to facilitate access for maintenance, inspection, and adjustment.

Typical operation and maintenance functions include the following activities:

1. Access the electrical control box and electrical junction box.
2. Open and close top cover.
3. Operate electrical controls.
4. Grease rotating assembly bearings.
5. Check and fill gearbox and drive clutch.
6. Connect and disconnect feed and liquid discharge lines.

EQUIPMENT LEVELING

The centrifuge must be properly leveled for satisfactory operation. The equipment must be leveled along the length and width of the unit (Figure 3020-1). A 2-foot or torpedo level is recommended. Non-compressible shims should be used as required to level the machine.

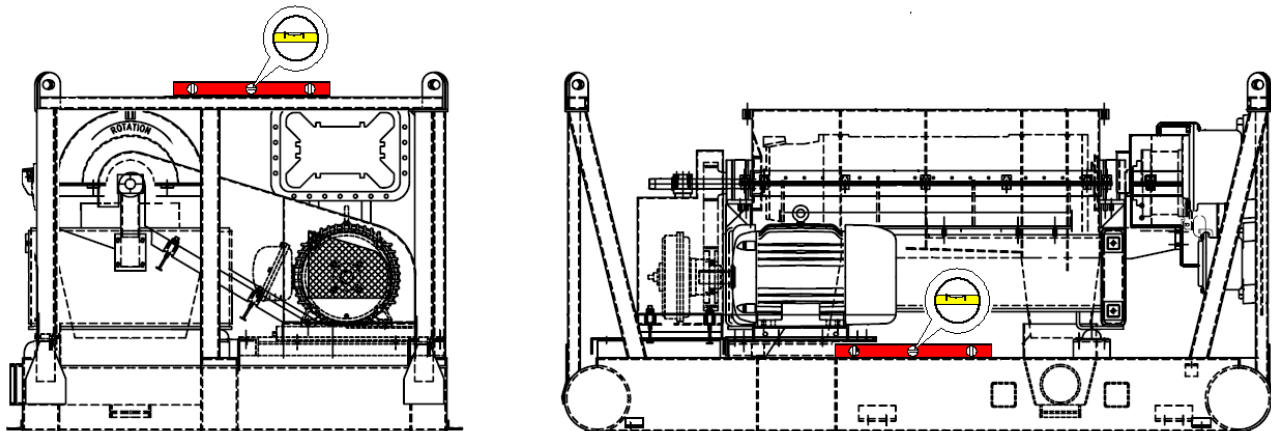


Figure 3020-1 Centrifuge Leveling

SHIPPING COMPONENTS



Note! Do not discard rotating assembly support shipping brackets after removal. These brackets must be re-installed whenever the machine is moved. These components prevent damage to the rotating assembly bearings during transit.

Following final positioning and leveling of the centrifuge, the shipping brackets and covers (Figure 3020-2) must be removed. The rotating assembly shipping brackets prevent bearing damage during transit, and the shipping covers protect the pillow block mounting surfaces.

Each shipping component is labeled **DISCONNECT BEFORE STARTUP**. To remove the shipping components, proceed as follows:

1. Remove rubber shipping covers from rotating assembly mounting blocks on the centrifuge base, and clean rust preventive from surfaces using WD-40 or equivalent.
2. Using WD-40 or equivalent, remove rust preventive from bottom of pillow blocks. Surfaces must be clean and burr free.
3. Turn shipping bracket jack bolts (Figure 3020-3) equally in a counterclockwise direction to slowly lower rotating assembly onto mounting blocks. Turn jack bolts until rotating assembly is fully resting on mounting blocks and bolts are disengaged from shipping brackets. Remove bolts and thick washers (Figure 3020-4), and remove shipping brackets by maneuvering out from under rotating assembly.
4. Insert alignment pins through bearing pillow blocks to align mounting holes, and then insert mounting bolts and tighten in accordance with applicable torque specification in DER05018.
5. Adjust drive belt tension in accordance with Preventive Maintenance in Section 5 - Maintenance.

SHIPPING COMPONENTS (CONT'D)

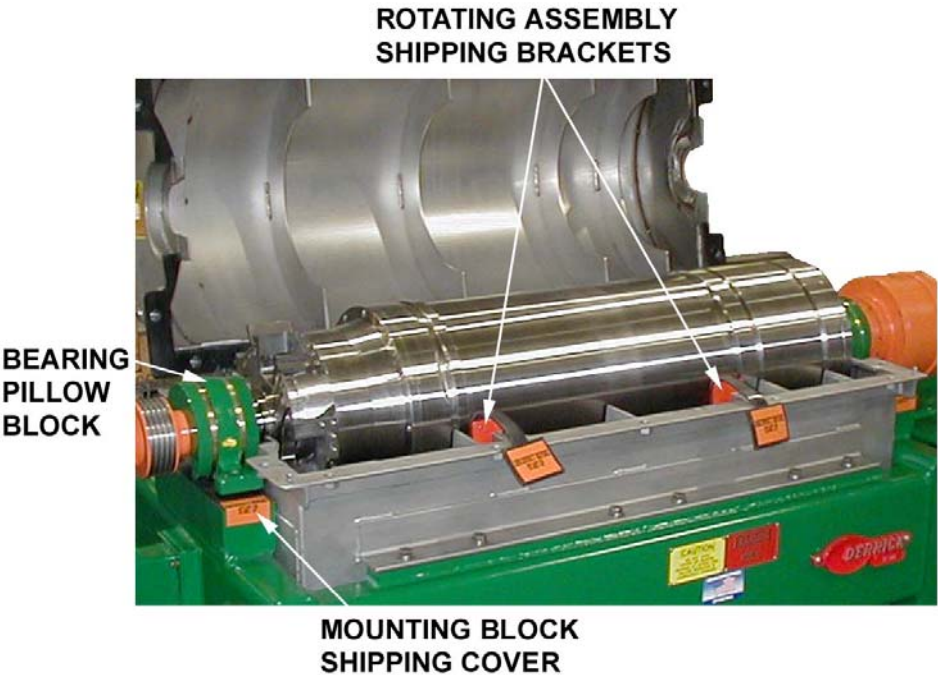


Figure 3020-3 Shipping Components Locations

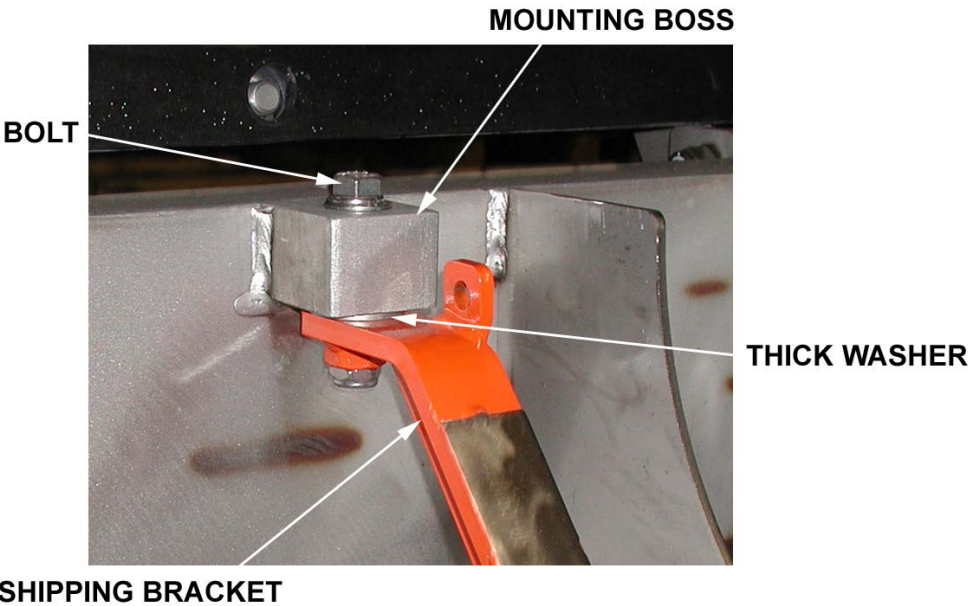


Figure 3020-4 Rotating Assembly Shipping Bracket Removal Detail




FEED PUMP

The customer must supply a positive-displacement feed pump of up to 15HP for delivering slurry to the centrifuge. The pump must be connected to the centrifuge's electrical control system as described in this document so that its operation can be supervised by the centrifuge.

ELECTRIC POWER CONNECTIONS

Three-phase line power and ground connections are required. In addition, the customer's feed pump must be connected to the centrifuge control circuit. All other connections have been made at the factory. Connect the facility's three-phase electric power supply and customer's feed pump to the electrical junction box in accordance with Figure 3020-5. Refer to the centrifuge electrical diagrams in Section 11 - Reference Drawings for additional assistance and information on electrical connections.

Incoming power to the centrifuge is three-phase 50 or 60 Hz supplied at the customer-specified voltage. The **drive motor is not dual wound** and must be operated at the design voltage. For motor specifications, refer to Section 12 - Supplier Data.

	WARNING! DRIVE MOTOR MUST BE OPERATED AT THE DESIGNATED SUPPLY VOLTAGE.
	WARNING! HIGH VOLTAGE MAY BE PRESENT. BE SURE FUSED DISCONNECT SUPPLYING ELECTRIC POWER TO THIS EQUIPMENT IS OPEN. LOCK OUT AND TAG OUT POWER SUPPLY TO PREVENT ACCIDENTAL APPLICATION OF POWER WHILE MAKING ELECTRICAL CONNECTIONS.
	WARNING! ELECTRICAL CONNECTIONS MUST BE MADE IN ACCORDANCE WITH THE NATIONAL ELECTRICAL CODE (NEC) AND ALL APPLICABLE LOCAL CODES. FAILURE TO COMPLY MAY RESULT IN AN UNSAFE CONDITION THAT COULD INJURE PERSONNEL OR DAMAGE EQUIPMENT. ENSURE THAT ALL ELECTRICAL AND CONDUIT CONNECTIONS ARE SECURE.

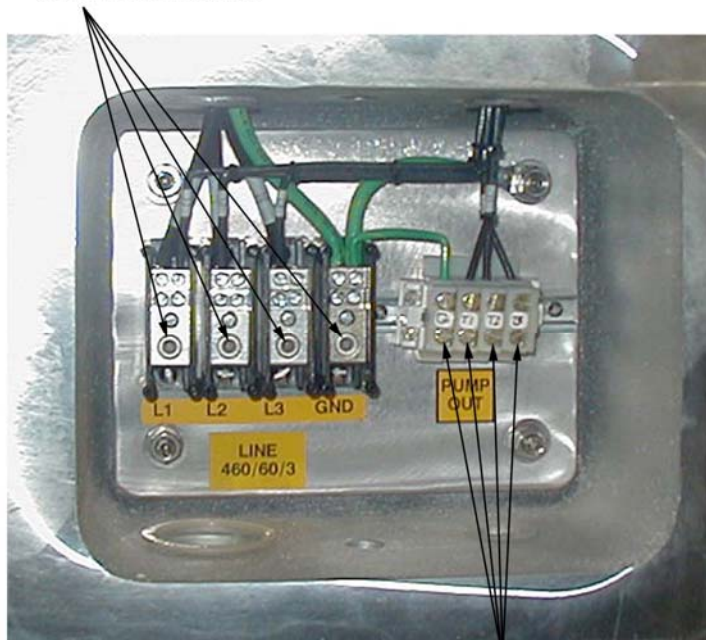
A fused disconnect primary power supply is required for this equipment. The fused disconnect and interconnecting wiring to the equipment must be suitably sized and in accordance with National Electrical Code (NEC) standards and all other applicable state and local codes.

Additional wiring requirements are as follows:

1. The fused disconnect device shall have sufficient interrupting capacity to clear the maximum fault current capability of the power supply system.
2. The GND connection in the power supply junction box must be connected to a known ground.
3. The feed pump connections are made to terminals in the electrical junction box as shown. The feed pump starter can operate a feed pump drive motor of up to 15 HP.

ELECTRIC POWER CONNECTIONS (CONT'D)

CENTRIFUGE POWER CONNECTIONS



FEED PUMP CONNECTIONS

Figure 3020-5 Electric Power and Feed Pump Connections

MACHINE STARTUP

Refer to Section 4 of this manual for initial startup and operating procedures for the centrifuge.



WARNING! DO NOT ATTEMPT TO OPERATE MACHINE WITH SHIPPING COMPONENTS INSTALLED.

The content of this document is subject to change at any time. Information provided does not cover all details or variations possible with DERRICK equipment; nor does it cover every contingency that may be met during installation, operation, maintenance, or troubleshooting of the equipment. If additional information is required, or should situations arise that are not covered by this manual, bring the matter to the attention of your local DERRICK representative or the Service Department at DERRICK Corporation in Buffalo, New York.

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OPERATING INSTRUCTIONS






DE-1000 CENTRIFUGE - GEARBOX DRIVE

GENERAL

This section includes initial and normal startup, operation, shutdown, and emergency shutdown procedures for the centrifuge. These procedures are for use only by trained personnel who are qualified to operate high-speed rotating equipment.

The centrifuge is designed to be operated only for the purpose specified at the time of purchase. Operation in any other application requires consultation with Derrick engineering.

OPERATING SAFETY

	WARNING! ALL OPERATING AND MAINTENANCE PERSONNEL MUST READ AND UNDERSTAND ALL SAFETY INFORMATION IN THIS MANUAL BEFORE WORKING WITH THE EQUIPMENT.
	WARNING! BE SURE THAT COVER IS CLOSED AND SECURED AND ALL PERSONNEL ARE CLEAR BEFORE STARTING MACHINE.
	WARNING! BE SURE THAT ALL SHIPPING BRACKETS HAVE BEEN REMOVED AND BEARING PILLOW BLOCKS ARE PROPERLY TIGHTENED.
	WARNING! ALWAYS ALLOW MACHINE TO COAST TO A COMPLETE STOP BEFORE OPENING COVER OR REMOVING GUARDS.
	WARNING! DO NOT OPERATE CENTRIFUGE IF EXCESSIVE NOISE OR VIBRATION DEVELOPS. ALWAYS CONFIRM THAT VIBRATION SWITCH AND OTHER SAFETY DEVICES ARE FUNCTIONAL.

INITIAL STARTUP

Perform the initial startup procedure when the centrifuge is being started for the first time following installation or after the machine has been relocated. Before beginning the procedure, verify the following:

1. All tools, documents, and shipping components have been removed and there are no obstructions to operation.
2. All personnel are clear of equipment.

INITIAL STARTUP PROCEDURE		
Step	Procedure	Reference
1	Confirm that all operators and maintenance personnel have read and understand all operating and safety information in Section 2 - Safety.	<u>DER02020</u>
2	Verify that equipment has been installed properly, all shipping brackets have been removed, and bearing pillow blocks have been tightened to specified torque.	<u>DER03020</u>
3	Check that services and utilities are available at the installation site.	<u>DER01320</u>
4	Check that cover is closed, all cover bolts are fully tightened, and all guards are in place.	—
5	Start centrifuge in accordance with Normal Startup procedure below.	—

NORMAL STARTUP

The following procedure shall be performed at each machine startup:

NORMAL STARTUP PROCEDURE	
Step	Procedure
1	Check that cover is closed, all cover bolts are fully tightened, and all guards are in place.
2	Rotate bowl assembly manually to check that the rotating assembly turns freely and no rubbing is felt.
3	Verify that all personnel are clear of centrifuge and all guards are in place before applying electric power to equipment.
4	Press CENTRIFUGE ON button to start the centrifuge drive motor. Confirm that conveyor is turning counterclockwise when looking toward liquid bowl head.
5	Press PUMP ON button to start feed pump, and slowly introduce feed to centrifuge.

OPERATION

Monitor the liquid and solids discharges continually to determine operating status of the centrifuge. Take corrective action if any anomaly is detected such as insufficient solids discharge and/or repetitive tripping of the overload release assembly. Note that any change in feed rate or adjustment of pond depth will not produce an immediate response from the centrifuge. It may take one or more hours of continuous operation before a change appears in the liquid and/or solids discharges. Continuously monitor the feed condition and liquid and solids discharges to detect any trend toward conveyor overloading, which may cause tripping of the overload release assembly.

The following parameters affect centrifuge operation:

- Feed rate
- Pond depth
- Bowl speed
- Conveyor speed

The feed rate and pond depth should be adjusted, as required, to optimize centrifuge operation and prevent tripping of the overload release assembly. Tripping indicates that the conveyor is becoming overburdened in moving solids. The conveyor speed is fixed by the gearbox reduction ratio and varies directly with bowl speed. Consequently, changing the motor sheave diameter alters both the bowl speed and corresponding conveyor speed. A larger diameter sheave will increase speed, and a smaller sheave reduces speed. The motor sheave should be replaced only after feed rate and pond depth adjustments have been unsuccessful in achieving satisfactory performance of the centrifuge.

Changing the feed rate and/or pond depth should produce the desired clarity of liquid effluent and solids dryness. Feed rate may be changed while the centrifuge is operating, but pond depth can be adjusted only with the centrifuge shut down and locked out and tagged out.

The differential speed between the liquid bowl and conveyor can be changed only by replacing the gearbox. Two gearbox ratios are available: 52:1 and 125:1. Changing the gearbox to the alternate ratio should be done **only** after all other options have been unsuccessful in achieving satisfactory centrifuge operation and after consulting with the Derrick Service Department.

Adjustments

The following paragraphs discuss the effects of changing feed rate, pond depth, bowl and conveyor speed, and gearbox ratio.

Feed Rate

If slurry is thin, increasing the feed rate may permit a higher processing rate. However, as feed rate is increased, the operator must check that the conveyor is moving the increased solids volume. The feed rate should be reduced if the overload release assembly trips repetitively.

Pond Depth

Pond depth can only be adjusted with the centrifuge fully stopped and locked out and tagged out. For this reason, pond depth is usually adjusted after the feed rate is adjusted. The factory pond depth setting of 3.4 is usually satisfactory when used in conjunction with feed rate adjustment. However, if desired results cannot be achieved by adjusting the feed rate, changing the pond depth may be helpful.

Four adjustable effluent ports (Figure 4097-1) on the liquid bowl head are used to set the pond depth; all ports must be set identically. A higher pond depth increases settling time by permitting more liquid to remain in the bowl. However, a higher pond depth also reduces the beach area at the solids discharge end of the bowl, which will result in a wetter solids discharge.

To adjust pond depth, proceed as follows:



WARNING! DO NOT OPEN COVER OR ATTEMPT AND ADJUSTMENT OR MAINTENANCE ON THE CENTRIFUGE UNLESS THE BOWL IS AT A COMPLETE STANDSTILL.

1. Shut down, lock out, and tag out the centrifuge using the Normal Shutdown procedure described later in this section.
2. Open case cover.
3. Loosen three screws securing mounting ring to liquid bowl head, rotate the effluent port until the desired setting is positioned at the alignment marks, and tighten screws. All four effluent ports must be set to the same position.
4. Close case cover after completing adjustments.

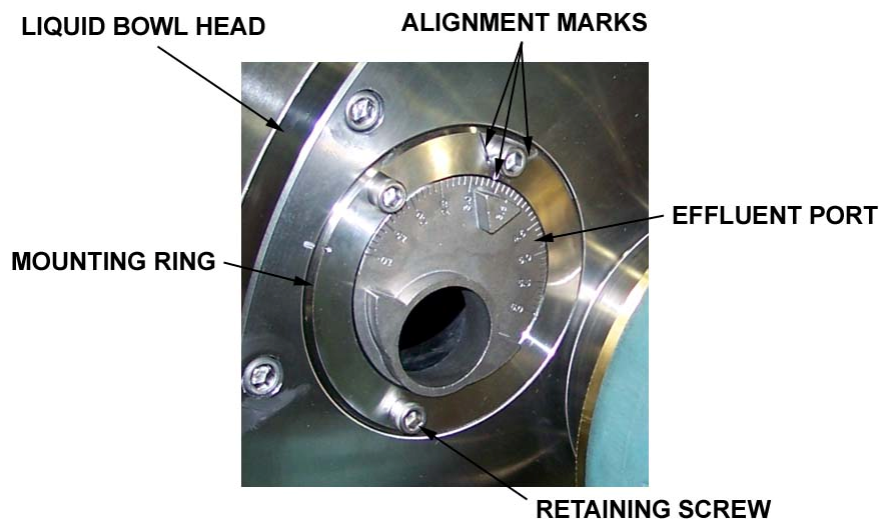


Figure 4097-1 Effluent Port Adjustment

Bowl and Conveyor Speeds

The faster the bowl speed, the faster solids are conveyed out of the centrifuge, but faster processing results in wetter solids discharge. To reduce wetness, the slurry must remain in the bowl longer, subjecting it to the settling process for a longer duration before being conveyed out the solids discharge. Conversely, reducing bowl speed may be desirable for thick, heavy slurry to maximize liquid extraction.

Since the conveyor speed is directly proportional to the bowl speed, increasing the bowl speed also increases conveyor speed. Bowl speed is changed by replacing the motor sheave. The table below lists the available motor sheaves and proper-size drive belts. Since changing the bowl speed requires partial disassembly of the centrifuge, it should be done only after feed rate and pond depth adjustments do not produce desired results. Refer to DER05104 in Section 5 for sheave removal and installation procedures.

GBD Centrifuge Motor Sheaves and Drive Belts			
Sheave Diameter	Bowl Speed (RPM)	Sheave Part No.	Belt Part No.
60 Hz Motor			
8"	2450	10603-00	5G3V1000
9"	2750	10603-05	5G3V1000
9.9"	3000	10603-01	5G3V1000
10.6"	3225	10603-02	5G3V1000
11.1"	3400	10603-06	5G3V1060
11.5"	3500	10603-03	5G3V1060
13.1"	4000	10603-04	5G3V1060
50 Hz Motor			
8"	2000	10603-00	5G3V1000
9"	2250	10603-05	5G3V1000
9.9"	2450	10603-01	5G3V1000
10.6"	2600	10603-02	5G3V1000
11.1"	2750	10603-06	5G3V1060
11.5"	2850	10603-03	5G3V1060
13.1"	3250	10603-04	5G3V1060

Gearbox Ratios

A larger motor sheave diameter increases the bowl speed but reduces the torque. Consequently, the feed rate may have to be reduced or the gearbox changed to a higher ratio to provide adequate torque. For example, if a 125:1 gearbox is replaced with a 52:1 ratio gearbox, the feed rate must be reduced by 10 percent to avoid overloading the centrifuge. Since gearbox replacement is a major alteration, it should be considered only after all other options have been unable to produce satisfactory performance and following consultation with the Derrick Service Department.

Overload Release Clutch Torque

Frequent overload tripping that cannot be corrected by feed rate and/or pond depth adjustments may be due to an incorrect torque setting of the overload release assembly. To check and adjust overload release assembly torque, refer to DER05104.

AUTOMATIC SHUTDOWNS

The centrifuge has built-in safety features to protect the equipment. These features will result in automatic shutdown of the centrifuge before damage occurs. The following paragraphs describe these automatic shutdowns.

Excessive Vibration

A vibration level of 2 Gs will cause the vibration switch to interrupt electric power to the centrifuge run relay, shutting down the machine. Such excessive vibration may occur during startup or normal operation due to slumping of the wall cake or other unbalanced condition of the bowl. The machine may be re-started by pressing the reset button on the vibration switch and then using the Normal Startup procedure above.

If nuisance tripping occurs during normal startup, the reset button may be held depressed until full speed is reached.

Motor Thermal Overload

Thermal overloads protect the circuits supplying electric power to the 50 HP centrifuge drive motor and feed pump motor. In case of excessive current draw through the centrifuge motor starter circuit, the thermal overload trips to disable the centrifuge run relay and shut down the motor. Excessive current draw through the pump starter circuit trips the thermal overload, which de-energizes the pump start relay to disable the feed pump motor. To re-start the centrifuge following shutdown due to a thermal overload trip, clear the cause of excessive current draw, press both RESET buttons, and then re-start the machine using the Normal Startup procedure above.

Motor Over-Temperature

If high temperature is sensed by the thermocouple embedded in the 50 HP motor winding, the motor over-temperature switch in the motor winding opens, disabling the centrifuge run relay and shutting down the motor. To re-start the centrifuge, allow the motor to cool, check for and remove the cause of over-temperature, and then re-start the machine using the Normal Startup procedure above.

Conveyor Over-Torque

If excessive torque is required to rotate the conveyor (335 in lbs for 52:1 gearbox; 200 in lbs for 125:1 gearbox), the overload clutch releases the conveyor from rotating and the over-torque limit switch shuts down electric power to the centrifuge and feed pump. The normally closed over-torque limit switch contacts are opened by the release roller arm, interrupting power to the 50 HP drive motor and feed pump motor. After release, the clutch must be manually reset (refer to Section 5 - Maintenance) before the centrifuge can be returned to operation.

NORMAL SHUTDOWN

The normal shutdown procedure is to be used for controlled stopping of operation. Normal shutdown is performed for routine activities such as cleaning, lubrication, inspection, or adjustment.



WARNING! CENTRIFUGE MUST BE FLUSHED OUT THOROUGHLY AT THE END OF THE DAY. UNLESS WASHED OUT, PROCESS MATERIAL WILL SAG AND DRY OUT CAUSING SEVERE OUT OF BALANCE. WHEN RE-STARTED, THE CENTRIFUGE WILL PRODUCE SEVERE VIBRATION, RESULTING IN AUTOMATIC SHUTDOWN.

NORMAL SHUTDOWN PROCEDURE	
Step	Procedure
1	Press PUMP OFF pushbutton to discontinue feed to centrifuge.
2	If the shutdown will extend for several hours (such as at the end of the day), flush out the centrifuge with clean liquid for 2 to 3 minutes. Unless flushed out, process material will sag and dry out, causing a severe out-of-balance condition.
3	Press CENTRIFUGE OFF button to shut down electric power to centrifuge. Open fused disconnect supplying electric power to the machine.
4	Lock out and tag out machine.

EMERGENCY SHUTDOWN

To immediately stop the centrifuge in case of emergency, open the fused disconnect supplying electric power to the machine.

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BEARING REPLACEMENT

DE-1000 CENTRIFUGE

GENERAL

This procedure describes replacement of the main bearings installed in the pillow blocks as well as the conveyor bearings located inside the conveyor. Excessive noise or vibration during centrifuge operation may indicate defective bearings. If such conditions are evident, the bearings should be inspected for looseness and replaced if necessary.

Bearing replacement must be performed by properly trained and qualified personnel. To prevent contamination of the new bearings and internal components of the centrifuge, the replacement procedure must be performed in a clean environment.

Refer to DER05102 for tools and equipment used in the procedures in this section.

PILLOW BLOCK BEARINGS

The ends of the rotating assembly are supported by roller bearings fitted within pillow blocks. Components on each side of the pillow block form a labyrinth grease cavity, which prevents contaminants from entering. The roller bearing has a separate inner race, which must be removed from the bowl head shaft following removal of the bearing.

The pillow block bearings must be replaced as a set. Consequently, if one bearing is found defective, always replace both bearings.

Removal

Either bearing may be removed first. In the following procedure, however, the liquid end pillow block bearing is removed first, followed by removal of the solids end bearing. If either bearing is found defective, both bearings must be replaced as a set.

Liquid End Pillow Block Bearing

To remove the liquid end main bearing, proceed as follows:



WARNING! TO AVOID SERIOUS PERSONAL INJURY BE SURE EQUIPMENT IS LOCKED OUT, TAGGED OUT, DE-ENERGIZED, AND HAS STOPPED ROTATING BEFORE PERFORMING MAINTENANCE AND/OR ADJUSTMENTS.

1. Shut down, lock out, and tag out electric power to the centrifuge. Allow rotating assembly to coast to a full stop.
2. Open case cover, and remove screws securing pillow blocks at liquid and solids ends to case.
3. Using a suitable hoist, lift rotating assembly to separate pillow blocks from bottom of case leaving sufficient clearance to permit removal of pillow blocks.

Liquid End Pillow Block Bearing(Cont'd)

4. Remove Rotodiff / gearbox from liquid bowl head (Figure 5017-1) as follows:
- Scribe a line across Rotodiff / gearbox and flange to ensure correct positioning upon installation. Using a 14mm hex wrench, remove six screws securing Rotodiff / gearbox to flange.
 - To ensure correct placement of shim(s), mark location of shim(s) between flange and Rotodiff / gearbox. Install two 3/8"-16 jack screws into flange clearance holes that are 180° apart. Using a 9/16" box wrench, alternately turn both jack screws a few revolutions at a time to begin separating Rotodiff / gearbox from flange.
 - To support unit during remainder of removal procedure, place lifting strap around Rotodiff / gearbox and attach strap to overhead lifting device. Fully separate unit from flange by alternately turning jack screws until unit is fully detached.
 - With Rotodiff / gearbox supported by lifting strap and overhead lifting device, **CAREFULLY** slide unit outward until free of splined shaft. Place Rotodiff / gearbox in a plastic bag to prevent contamination.



Step 4a - Rotodiff / Gearbox Attaching Screws



Step 4b - Using Jack Screws to Separate Rotodiff / Gearbox From Flange



Step 4c - Using Sling to Support Rotodiff / Gearbox During Removal

Figure 5017-1 Rotodiff / Gearbox Removal

5. Turn flange (Figure 5017-2) until large access holes in flange align with retaining screws for outboard flinger cover. Remove screws securing outboard flinger cover to pillow block, and lift and remove flinger cover.
6. Remove screws securing flange to liquid bowl head, and loosen set screw securing flange to liquid bowl head.

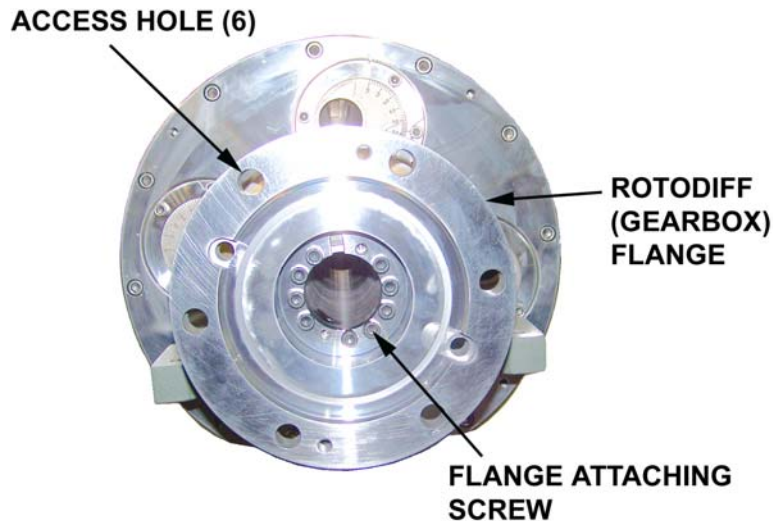


Figure 5017-2 Rotodiff / Gearbox Flange Attachment

7. Thread two jack screws into flange, and alternately turn each screw a few turns at a time until flange is separated from liquid bowl head; then grasp flange, and pull from liquid bowl head.



Note! Outboard flinger will remain attached to flange.

8. Remove flathead screws securing outboard pillow block cover (Figure 5017-3) to pillow block, and remove cover. Separate O-ring from pillow block cover and discard O-ring.
9. Remove flat head screws securing inboard pillow block cover to pillow block, and slide pillow block (Figure 5017-4) and bearing outer race and rollers off liquid bowl head.
10. Loosen set screw securing inboard flinger to liquid bowl head.
11. Using a suitable puller, and extreme care to avoid damaging bearing seat or shoulder on liquid bowl head, remove bearing inner race from bowl head. Discard inner race.
12. Slide inboard pillow block cover and flinger off bowl head. Separate O-ring from pillow block cover and discard O-ring.
13. Using a suitable puller, remove bearing outer race and rollers from pillow block. Discard outer race and rollers.

Liquid End Pillow Block Bearing (Cont'd)

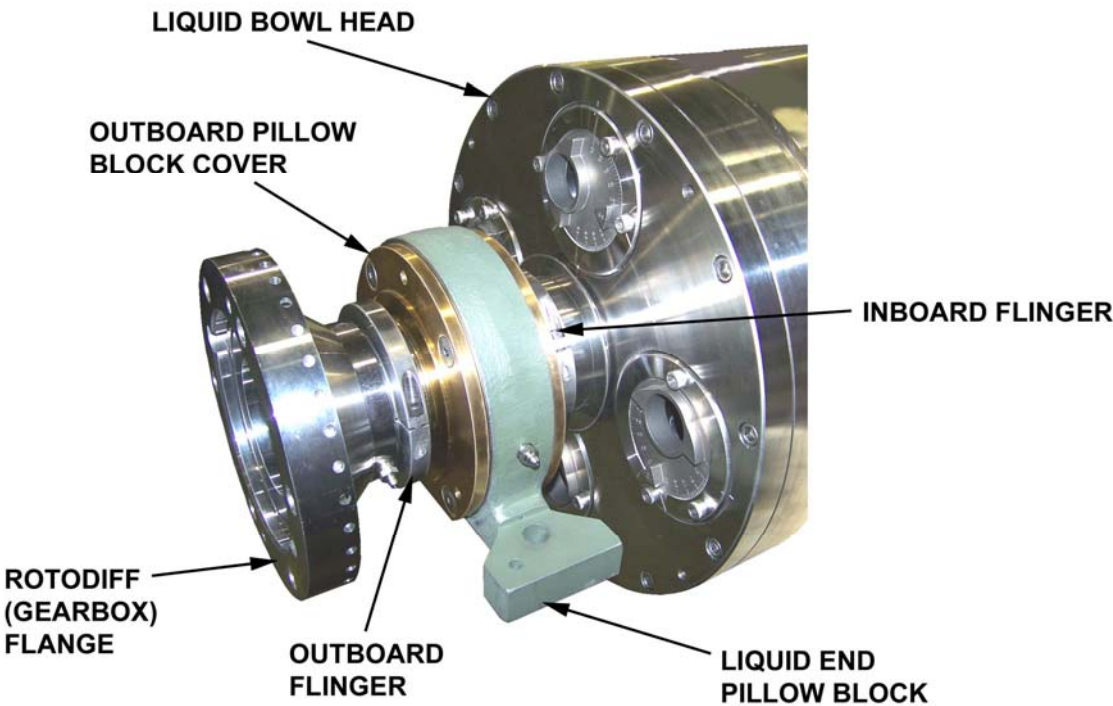


Figure 5017-3 Liquid End Pillow Block and Bearing Components Location

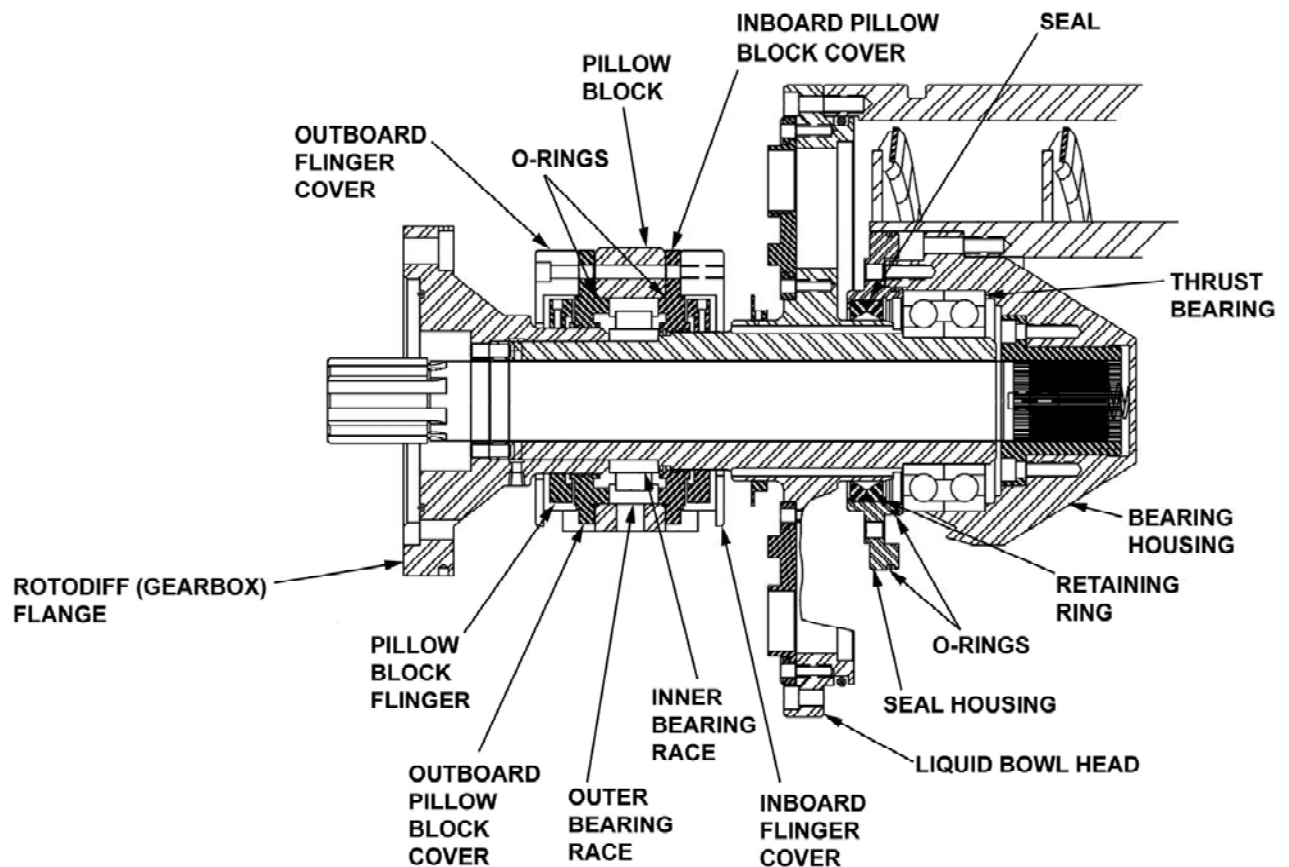


Figure 5017-4 Liquid End Cross Section

Solids End Pillow Block Bearing

With liquid end pillow block bearing previously removed and rotating assembly remaining suspended, remove the solids end pillow block bearing (Figure 5017-5) as follows:

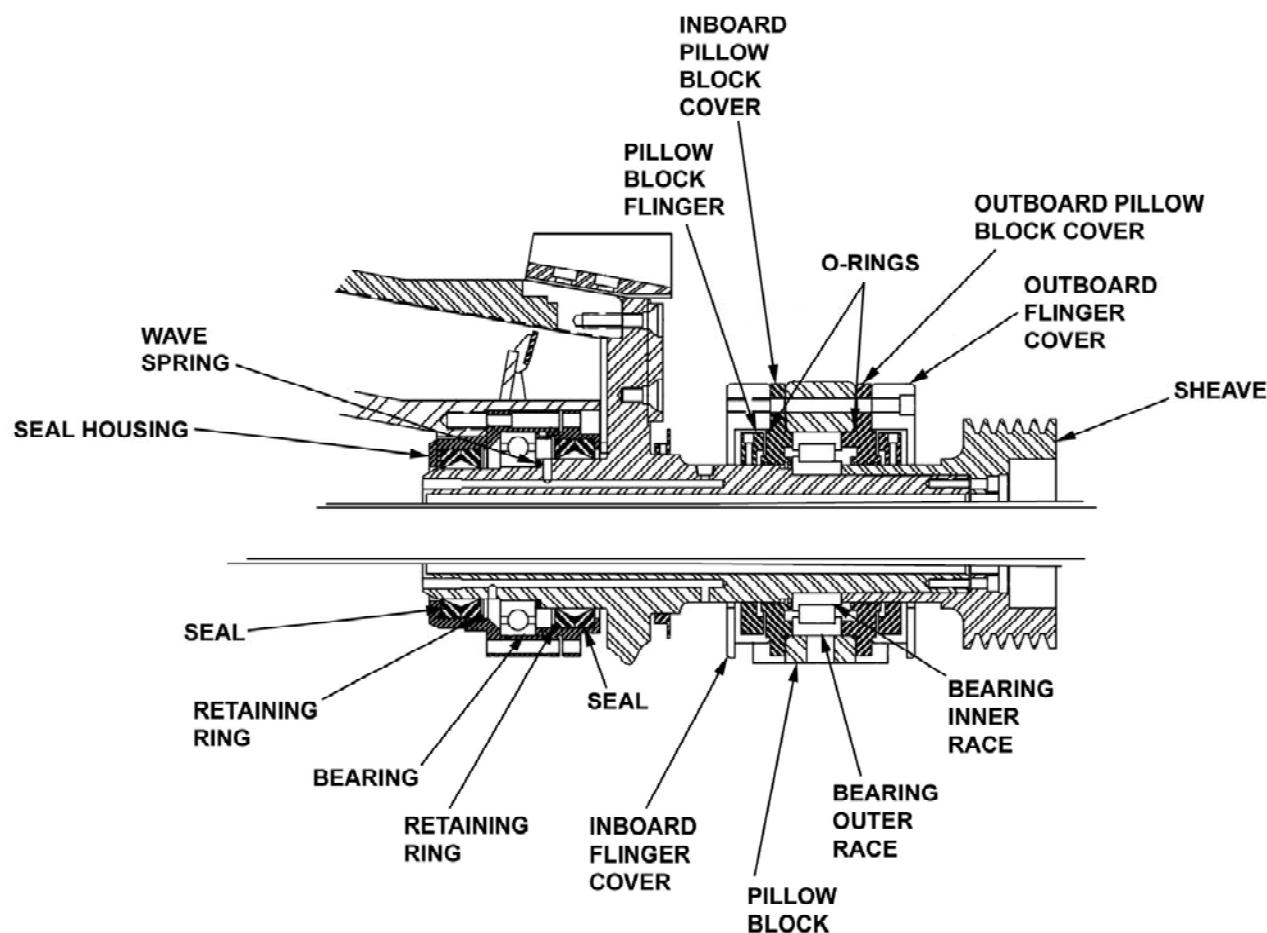
1. Remove screws securing inboard and outboard flinger covers to pillow block, and lift and remove inboard flinger cover.
2. Record alignment marks on sheave, and then remove screws securing sheave to solid bowl head.
3. Thread two jack screws into sheave, and alternately turn each screw a few turns at a time until sheave is separated from solid bowl head; remove sheave and outboard flinger cover.
4. Grasp sheave, and pull from liquid bowl head.



Note! Outboard flinger will remain attached to sheave.

Solids End Pillow Block Bearing (Cont'd)

5. Remove flathead screws securing outboard pillow block cover to pillow block, and remove cover. Separate O-ring from pillow block cover and discard O-ring.
6. Remove flat head screws securing inboard pillow block cover to pillow block, and slide pillow block and bearing outer race and rollers off solids bowl head.
7. Loosen set screw securing inboard flinger to solid bowl head.
8. Using a suitable puller and extreme care to avoid damaging bearing seat or shoulder on solid bowl head, remove bearing inner race from bowl head. Discard inner race.
9. Slide inboard pillow block cover and flinger off bowl head. Separate O-ring from pillow block cover and discard O-ring.
10. Using a suitable puller, remove bearing outer race and rollers from pillow block. Discard outer race and rollers.

**Figure 5017-5 Solids End Cross Section**

Cleaning, Inspection, and Repair

1. Clean all components with a suitable cleaner/degreasing agent, and blow dry with filtered compressed air. Remove any corrosion to facilitate inspection.
2. Inspect bowl heads for scratches, nicks, burrs, or deformation that may affect suitability for returning to service. Blend out any minor surface defects. Replace bowl head if shaft is obviously deformed or serious flaws are found that render the bowl head unserviceable.
3. Test fit a new bearing inner race on the main bearing journals of both bowl heads. If the journal is undersize, the inner race will slide easily onto the journal. Replace the bowl head if journal is undersize.
4. Inspect pillow block covers, flingers, and flinger covers for corrosion, distortion, nicks, cracks, burrs, fractures, or other defects. Repair any minor defects.
5. Replace any component that cannot be easily repaired. Replace all O-rings, seals, and bearings.
6. Place all cleaned components in clean plastic bags to prevent contamination.

Installation

The procedure describes installation of the liquid end pillow block bearing first, followed by the solids end procedure. However, either pillow block bearing may be installed first on its respective bowl head.

Liquid End Pillow Block Bearing



WARNING! IN THE FOLLOWING STEP, USE EITHER A BEARING HEATER OR A CLEAN HEATED OIL BATH TO HEAT BEARING INNER RACE. DO NOT USE A TORCH, AS THIS WILL DAMAGE THE BEARING.

1. Place inner race of liquid end pillow block bearing in a bearing heater or clean heated oil bath, and heat to approximately 230°F (Figure 5017-6). Do not use a torch to heat inner race, as this will damage the race.
2. Wearing insulated gloves, remove heated inner race from bearing heater, and immediately slide onto bearing journal until seated against bowl head shoulder. Allow inner race to cool until unmovable on liquid bowl head.
3. Slide inboard pillow block flinger onto shaft, followed by pillow block cover. Do not tighten flinger set screw at this time.
4. Position bearing outer race and rollers into chamfer of pillow block. Using a suitable tool that contacts only the outer bearing race, carefully tap outer race into pillow block until about 1/8-inch below the surface of the pillow block.
5. Install new O-ring against shoulder of inboard pillow block cover, and slide pillow block cover onto shaft.
6. Apply sufficient quantity of the bearing grease listed in customer specification to completely cover bearing rollers.

Liquid End Pillow Block Bearing (Cont'd)

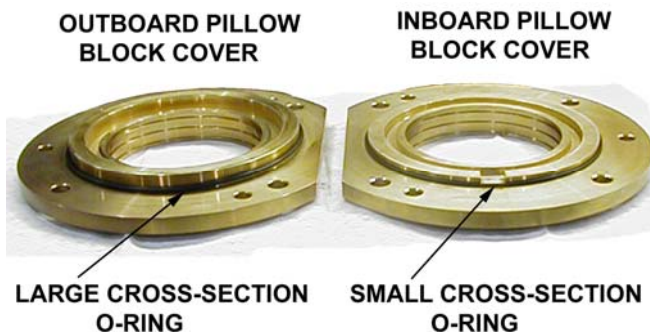
7. Slide assembled pillow block and bearing outer race onto inner race previously installed on bearing journal.
8. Install new O-ring against shoulder of outboard pillow block cover, slide pillow block cover onto shaft, and rest against pillow block.
9. Orient inboard pillow block cover so that flat edge is aligned with bottom of pillow block.
10. Apply anti-seize compound to four flat head screws, and install screws to secure inboard pillow block cover to pillow block. Tighten screws in accordance with DER05018.
11. Orient outboard pillow block cover so that flat edge is aligned with bottom of pillow block.
12. Apply anti-seize compound to four flat head screws, and install screws to secure outboard pillow block cover to pillow block and draw bearing into proper position within pillow block. Tighten screws in accordance with DER05018.
13. Slide outboard bearing flinger onto Rotodiff / gearbox flange, but leave screw loose.
14. Apply a light coat of grease to surface of bowl shaft where Rotodiff / gearbox flange mounts.
15. Heat flange to 200°F. While handling with insulated gloves, orient notch in flange with key on liquid bowl head shaft and install flange on shaft. Tighten set screw to secure flange.
16. Slide inboard and outboard pillow block flingers close to pillow block covers, leaving about 1/16-in. clearance, and tighten set screws on both flingers.
17. Install flinger covers, and secure with screws.
18. Using lifting strap and overhead lifting device, orient Rotodiff / gearbox with lines scribed during removal aligned, and slide Rotodiff onto splined shaft. Insert screws through flange and into Rotodiff, insert shims at locations marked during removal, and tighten screws.

Solids End Pillow Block Bearing

WARNING! IN THE FOLLOWING STEP, USE EITHER A BEARING HEATER OR A CLEAN HEATED OIL BATH TO HEAT BEARING INNER RACE. DO NOT USE A TORCH, AS THIS WILL DAMAGE THE BEARING.

1. Place bearing inner race in a bearing heater or heated clean oil bath, and heat to approximately 230°F (Figure 5017-6). Do not use a torch to heat the inner race, as this will damage the race.
2. Wearing insulated gloves, remove heated inner race from bearing heater, and immediately slide onto bearing journal until seated against bowl head shoulder. Allow inner race to cool until unmovable on solid bowl head.
3. Slide inboard pillow block flinger onto shaft, followed by pillow block cover. Do not tighten flinger set screw at this time.
4. Position bearing outer race and rollers into chamfer of pillow block. Using a suitable tool that contacts only the outer bearing race, carefully tap outer race into pillow block until about 1/8-inch below the surface of the pillow block.

5. Install new small cross-section O-ring against shoulder of inboard pillow block cover, and slide pillow block cover onto shaft.
6. Apply sufficient quantity of bearing grease listed in customer specification to completely cover bearing rollers.
7. Slide assembled pillow block and bearing outer race onto inner race previously installed on bearing journal.
8. Install new large cross-section O-ring against shoulder of outboard pillow block cover, slide pillow block cover onto shaft, and rest against pillow block.
9. Orient inboard pillow block cover so that flat edge is aligned with bottom of pillow block.

BEARING INNER RACE**TAPPING BEARING INTO PILLOW BLOCK****Figure 5017-6 Pillow Block Bearing Installation Details**

10. Apply anti-seize compound to four flat head screws, and install screws to secure inboard pillow block cover to pillow block. Tighten screws in accordance with DER05018.
11. Orient outboard pillow block cover so that flat edge is aligned with bottom of pillow block.
12. Apply anti-seize compound to four flat head screws, and install screws to secure outboard pillow block cover to pillow block and draw bearing into proper position within pillow block. Tighten screws in accordance with DER05018.
13. Slide outboard bearing flinger onto sheave, but leave screw loose.

Solids End Pillow Block Bearing (Cont'd)

14. Apply a light coat of grease to surface of bowl shaft where sheave mounts.
15. Heat sheave to 200°F. While handling with insulated gloves, orient notch in sheave with key on solid bowl head shaft and install sheave on shaft. Secure sheave with screws.
16. Slide inboard and outboard pillow block flingers close to pillow block covers, leaving about 1/16-in. clearance, and tighten set screws on both flingers.
17. Install flinger covers, and secure screws.
18. Operate hoist to lower rotating assembly into centrifuge until pillow blocks contact base.
19. Insert alignment pins into pillow block alignment holes, and insert bolts. Remove alignment pins, and tighten pillow block bolts in accordance with DER05018.

CONVEYOR BEARINGS

This procedure requires removal of the conveyor assembly from the bowl assembly. Conveyor bearing replacement must be performed in a clean environment by trained, qualified personnel.

If the conveyor bearings are found to be defective, it is likely that the conveyor will require complete overhaul. Consequently, all parts should be carefully inspected, and fits and clearances should be measured in accordance with drawing 15082-00 in Section 11 to determine their suitability for re-use.

Removal

The liquid end contains two thrust bearings, and a single ball bearing is installed at the solid end of the conveyor. Replace all conveyor bearings as a set if excessive vibration, end play, or radial looseness is found. The following procedure describes removal of the liquid end bearing and then the solid end bearing. To remove the conveyor bearings, proceed as follows:

1. Remove conveyor from rotating assembly in accordance with Preventive Maintenance, DER05022.
2. With conveyor supported, remove screws securing lifting bracket to conveyor and remove lifting bracket.
3. Remove liquid end thrust bearings as follows:
 1. Remove screws securing liquid end seal housing (Figure 5017-4) to bearing housing, and remove seal housing. Remove and discard O-rings installed in external grooves of seal housing.
 2. Using a suitable hammer-type puller, extract both thrust bearings from liquid end bearing housing. Discard bearings.
 3. Remove retaining ring securing seal in seal housing, and remove and discard seal.
4. Remove solids end bearing as follows:
 - a. Remove screws securing seal housing and bearing housing (Figure 5017-5) to conveyor, and remove seal housing and bearing housing. Separate seal housing from bearing housing.

- b. Remove retaining ring securing seal within seal housing. Remove and discard seal and O-ring from seal housing.
- c. Extract bearing from bearing housing, and discard bearing.
- d. Remove retaining ring securing seal within bearing housing, and remove and discard seal.
- e. Remove wave spring from solid bowl head shaft.

Cleaning, Inspection, and Repair

1. Clean all components with a suitable cleaner/degreasing agent, and blow dry with filtered compressed air. Remove any corrosion to facilitate inspection.
2. Inspect bowl head shafts for scratches, nicks, burrs, or deformation that may affect suitability for returning to service. Blend out any minor surface defects. Replace bowl head if shaft is obviously deformed or serious flaws are found that render the bowl head unserviceable.
3. Inspect bearing and seal housings for corrosion, distortion, nicks, cracks, burrs, fractures, or other defects. Repair any minor defects.
4. Check that solid bowl head wave spring has retained its tension. Replace if damaged tension is insufficient.
5. Replace any component found having damage that cannot be easily repaired. Replace all seals, O-rings, and bearings.
6. Test fit a new bearing inner race in the bearing housing of both bowl heads. If the bore is undersize, the outer race will slide easily into the bore. Replace the bearing housing(s) if bore is found loose.
7. Place all cleaned components in clean plastic bags to prevent contamination.

Installation

Bearing installation is the reverse of removal. Parts must be clean, and the procedure must be performed in a clean environment to prevent contamination of the new bearings. Be sure to replace all conveyor bearings as a set. The liquid end thrust bearings are installed first, followed installation of the solid end bearing.

1. To install the liquid end conveyor bearings, proceed as follows:
 - a. Insert new seal into liquid end seal housing (Figure 5017-4), and secure with retaining ring. Install new O-rings in external grooves of seal housing.
 - b. Place one new thrust bearing on bore of bearing housing and, using a suitable tool, tap bearing evenly into place against shoulder of bearing housing. Orient second thrust bearing with part number up to facilitate identification, and install into housing on top of previous bearing.
 - c. Install new O-rings into external grooves of seal housing.
 - d. Position seal housing on bearing housing, and secure with screws. Tighten screws in accordance with DER05018.

Installation (Cont'd)

2. To install the solids end conveyor bearing, proceed as follows:
 - a. Insert new seal into seal housing (Figure 5017-5), and secure with retaining ring.
 - b. Install new O-ring into external groove of seal housing.
 - c. Insert new seal into bearing housing, and secure with retaining ring.
 - d. Insert new bearing into bearing housing, and fully seat against shoulder.
 - e. Insert bearing housing into conveyor opening, place seal over bearing housing, and secure both housings to conveyor with screws. Torque screws in accordance with DER05018.
3. Re-install conveyor in bowl assembly, and install bowl assembly on centrifuge in accordance with DER05022.

The content of this document is subject to change at any time. Information provided does not cover all details or variations possible with DERRICK equipment, nor does it cover every contingency that may be met in conjunction with installation, operation, maintenance, or troubleshooting of the equipment. Should additional information be required, or should situations arise that are not covered by this manual, bring the matter to the attention of your local DERRICK representative or the Service Department at DERRICK Corporation in Buffalo, New York.

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Effective Date	15 Oct 07
Supersedes	25 May 07
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HARDWARE TORQUE SPECIFICATIONS

DE-1000 CENTRIFUGE

GENERAL

Use only hardware that is approved by Derrick® Corporation. The use of potentially inferior, non-Derrick approved hardware may result in serious injury to personnel and/or damage to equipment. Additionally, any warranty in force, whether written or implied, may be voided by use of unapproved hardware. Contact Derrick Corporation with questions pertaining to hardware type and usage associated with Derrick centrifuges.

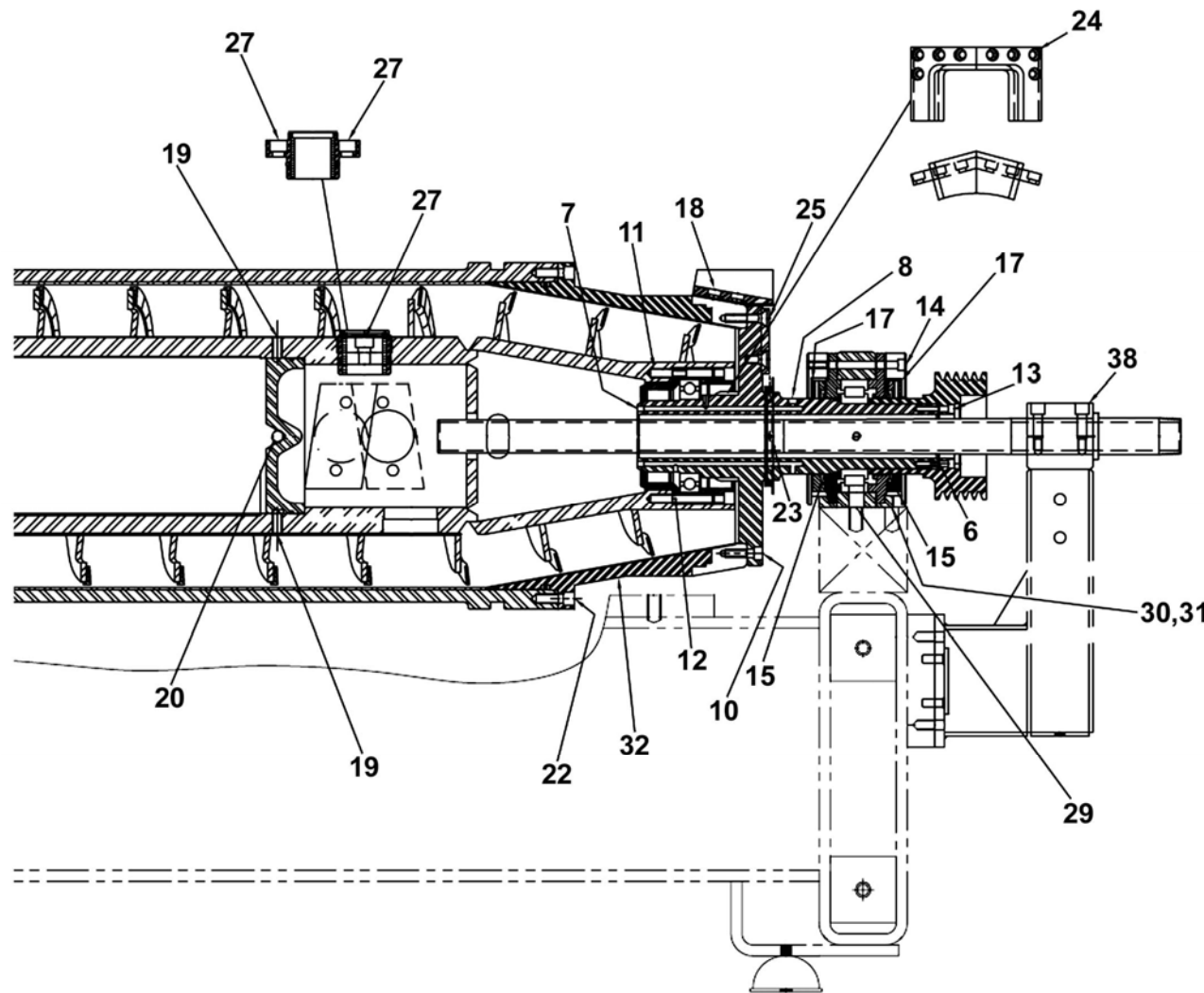


WARNING! USE OF INFERIOR, NON-DERRICK APPROVED HARDWARE MAY RESULT IN SERIOUS INJURY TO PERSONNEL AND/OR DAMAGE TO EQUIPMENT.

Recommended seating torque specifications, lubricants, and hardware installation procedures for the various types and sizes of hardware used on the centrifuge are shown on the following pages.

Use the following procedure when tightening hardware:

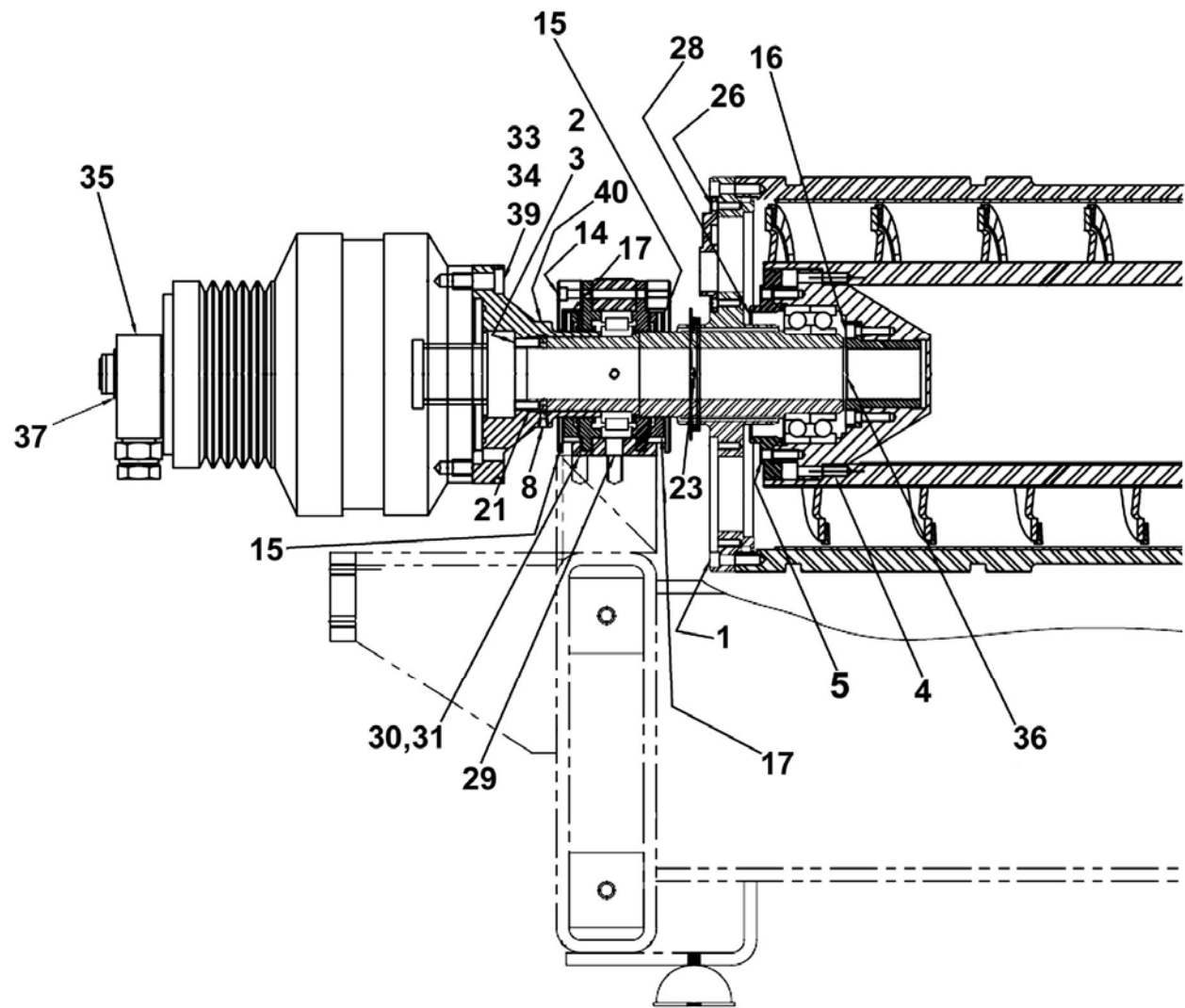
1. Use only a calibrated torque wrench.
2. When tightening more than one bolt, alternate tightening between bolts.
3. Always approach the final torque in several stages.



Rotating Assembly Hardware Installation - Solids End

Solid End Hardware Installation					
No.	Description	Qty	Lubricant	Torque	Location
6	1/4 x 1-1/4 Pin	4	Loctite 680	252 in-lbs	Sol. End Bowl Hd
7	5/16-18 x 1/2 Set Screw	2	Loctite 262	N/A	Sol. End Bowl Hd
8	1/8 NPT x 3/4 Gr. Fitting	4	N/A	N/A	Sol. End Bowl Hd
9	Plastic Cap	2	N/A	N/A	Sol. End Bowl Hd
10	3/8-16 x 1 Hx Skt Hd	8	Anti-Seize	252 in-lbs	Sol. End Bowl Hd
11	5/16-18 x 3 Hx Skt Hd	6	Anti-Seize	144 in-lbs	Sol. End Seal Hsng
12	1/4 x 1 Pin	1	Loctite 680	N/A	Sol. End Bearing Hsng
14	5/16-18 x 4 Hx Hd	6	Anti-Seize	Unspecified	Flinger Cover
15	3/8-16 x 1 Flt Hx Skt Hd	16	Anti-Seize	183 in-lbs	Pillow Block Cover
17	1/4-20 x 5/8 Hx Skt Hd	4	Anti-Seize	144 in-lbs	Pillow Block Flinger
18	3/8-16 x 3/4 Hx Skt Hd	8	Anti-Seize	252 in-lbs	Case Plows
19	3/8-16 x 1 Set Screw	2	Anti-Seize	75 in-lbs	Feed Accel. Bump
20	1/2-13 x 1 Set Screw	2	Anti-Seize	265 in-lbs	Feed Accel. Bump
21*	5/16-18 x 1 Hx Skt Hd	9	Loctite 262	300 in-lbs	Rotodiff/Gearbox Flange
22	3/8-16 x 1 Hx Skt Hd	12	Anti-Seize	252 in-lbs	Bowl Extension
23	10-24 x 1/4 Set Screw	4	Anti-Seize	N/A	Case Flinger
24	5/16-18 x 3/4 Hx Skt Hd	32	Anti-Seize	144 in-lbs	Wear inserts
25	3/8-16 x 3/4 Flt Hx Skt Hd	4	Anti-Seize	183 in-lbs	Solid Hd Plows
27	1/2-13 x 1 Hx Skt Hd	8	Anti-Seize	53 in-lbs	Feed Nozzle
28	3/8-16 x 1/2 Set Screw	2	Anti-Seize	N/A	Seal Hsng
29	5/8 x 11 x 2-1/4 Hx Hd	4	Anti-Seize	197 ft-lbs	Pillow Block
30	#8 Pin (7/16-20 x 2-1/2)	4	Anti-Seize	N/A	Pillow Block
31	#7 Pin (3/24-20 x 2-1/2)	4	Anti-Seize	N/A	Pillow Block
32	#8 Plug	1	Anti-Seize	35 ft-lbs	Bowl Extension
38	3/8-16 x 2-1/2 Hx Hd	4	Anti-Seize	Unspecified	Feed Tube Mtng Blk

* No. 21 - Quantity of 4 on serial numbers below CF000272
Quantity of 6 on serial numbers CF000272 thru CF000678
Quantity of 9 on serial numbers above CF000679



Rotating Assembly Hardware Installation- Liquid End

Liquid End Hardware Installation					
No.	Description	Qty	Lubricant	Torque	Location
1	3/8-16 x 1-1/4 Hx Skt Hd	12	Anti-Seize	252 in-lbs	Liq. End Bowl Hd
2*	5/16 x 1 Pin	4	Loctite 680	N/A	Liq. End Bowl Hd
3	5/16 x 5/16 x 3 Key	1	N/A	N/A	Liq. End Bowl Hd
4	3/8-16 x 1-1/2 Hx Skt Hd	8	Anti-Seize	252 in-lbs	Liq End Bearing Hsng
5	3/8-16 x 1 Hx Skt Hd	4	Anti-Seize	252 in-lbs	Liq. End Seal Hsng
13	1/4-20 x 1 Hx Skt Hd	8	Anti-Seize	83 in-lbs	Pulley Sheave
14	5/16-18 x 4 Hx Hd	6	Anti-Seize	Unspecified	Flinger Cover
15	3/8-16 x 1 Flt Hx Skt Hd	16	Anti-Seize	183 in-lbs	Pillow Block Cover
16	3/8-16 x 1 Hx Skt Hd	8	Anti-Seize	252 in-lbs	Spline Hub
17	1/4-20 x 5/8 Hx Skt Hd	4	Anti-Seize	144 in-lbs	Pillow Block Flinger
21*	5/16-18 x 1 Hx Skt Hd	9	Loctite 262	300 in-lbs	Rotodiff/Gearbox Flange
26	5/16-18 x 7/8 Hx Skt Hd	12	Anti-Seize	144 in-lbs	Effluent Port
28	3/8-16 x 1/2 Set Screw	2	Anti-Seize	N/A	Seal Housing
29	5/8-11 x 2-1/4 Hx Hd	4	Anti-Seize	197 ft-lbs	Pillow Block
30	#8 Pin (7/16-20 x 2-1/2)	4	Anti-Seize	N/A	Pillow Block
31	#7 Pin (3/24-20 x 2-1/2)	4	Anti-Seize	N/A	Pillow Block
33***	M16 x 35 Hx Skt Hd	6	Anti-Seize	N/A	Rotodiff to Roto. Flange
34	5/16-18 x 3/4 Hx Skt Hd	6	Anti-Seize	N/A	Gearbox to Gbx. Flange
35**	3mm Set Screw	1	Anti-Seize	N/A	Port Block
36	3/8 x 1 Pin	2	Loctite 680	N/A	Spline Hub
37**	30 x 1.5 mm x 1.4W Snap Ring	1	N/A	N/A	Rotodiff Port Block
39***	M16 x 40 Hx Skt Hd	6	Anti-Seize	N/A	Rotodiff to Roto. Flange
40	5/16-18 x 1/2 Set Screw	1	Anti-Seize	N/A	Flange to Key

* No. 2 - Quantity of 4 on serial numbers below CF000272
Quantity of 2 on serial numbers CF000272 thru CF000678

* No. 2 - Quantity of 0 on serial numbers above CF000979
Quantity of 2 on serial numbers CF000272 thru CF000678

* No. 21 - Quantity of 4 on serial numbers below CF000272
Quantity of 6 on serial numbers CF000272 thru CF000678
Quantity of 9 on serial numbers above CF000679

** Nos. 35 & 37 - Not used on serial numbers above CF000678

*** No. 33 - Used with Rotodiff 107/D6V

*** No. 39 - Used with Rotodiff 1071

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PREVENTIVE MAINTENANCE

DE-1000 CENTRIFUGE - GEARBOX DRIVE

GENERAL

Preventive maintenance consists of overall inspection, cleaning, and lubrication. Routine maintenance will ensure maximum life and trouble-free operation. While the maintenance schedule presented in this section is not rigid, modifications should be based on experience with operating the equipment at your facilities. A maintenance log using document DER13000 should be kept to help establish a routine maintenance schedule, as well as to monitor and adjust the schedule as necessary throughout the equipment's life.

Consider the following factors when establishing a maintenance schedule:

- Duty cycle
- Ambient temperature
- Operating environment

Following is the recommended routine maintenance schedule:

PREVENTIVE MAINTENANCE SCHEDULE	
Action	Frequency
Inspect feed tube connection for leaks, and tighten connection clamp as required.	Each shift
Inspect liquid discharge connection for leaks. Tighten connection and/or add silicone sealant to prevent leakage.	Each shift
Grease rotating assembly bearings (Figure 5022-1).	One shot each shift
Remove feed tube, clean interior of tube, and reinstall.	Weekly
Check gearbox fluid level with fill plug at 12 o'clock position.	Every 2 weeks
Check fluid coupling level with fill plug at 12 o'clock position.	Every 2 weeks
Check interior and exterior of case for accumulated solids, and clean as required.	Weekly
Purge conveyor bearings	Every 2 weeks
Remove belt cover, inspect belt for damage, and check/adjust tension.	Monthly
Remove and clean flinger covers	Monthly
Check overload release clutch torque setting	Every 250 hours
Grease overload release clutch	Every 1000 hours

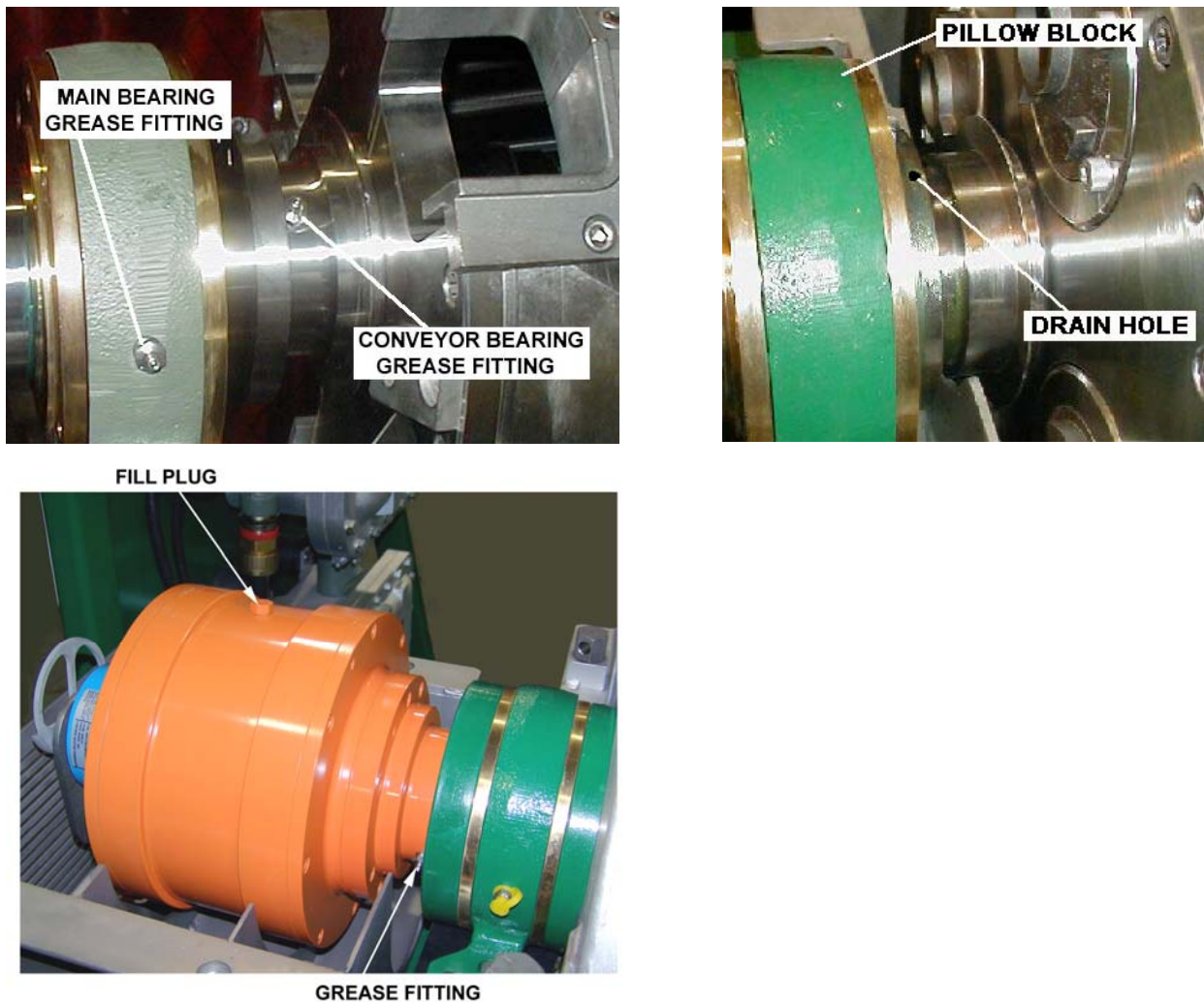


Figure 5022-1 Bearing Lubrication Points

PARTS REPLACEMENT

Defective parts should be replaced as soon as possible to prevent further damage to equipment. Refer to the general arrangement drawing, , rotating assembly drawing, and electrical drawings in Section 11 - Reference Drawings, for Derrick component locations and part numbers. Refer to Section 12 for supplier component information.

MAINTENANCE PROCEDURES

The following paragraphs describe maintenance procedures for centrifuge components and assemblies. Obvious procedures are omitted.



WARNING! HIGH VOLTAGE MAY BE PRESENT. ALWAYS OPEN FUSED DISCONNECT SUPPLYING ELECTRIC POWER TO THE EQUIPMENT, AND LOCK OUT AND TAG OUT POWER SUPPLY BEFORE PERFORMING ANY MAINTENANCE PROCEDURES.



WARNING! FAILURE TO WEAR SAFETY GLASSES MAY RESULT IN SERIOUS EYE INJURY OR PERMANENT LOSS OF VISION. SAFETY GLASSES MUST BE WORN AT ALL TIMES WHILE PERFORMING ANY MAINTENANCE PROCEDURE.

Drive Belt

The drive belt should be replaced if inspection reveals damage or deterioration. To replace the belt, proceed as follows:

1. Loosen screws securing feed tube clamp, and slide out feed tube.
2. Release latches, and remove belt guard covering sheaves and fluid coupling.
3. Loosen locking nuts securing drive motor feet to base (Figure 5022-2), turn adjustment bolts counterclockwise to loosen belt, and slip belt off sheaves.
4. Check sheave parallel alignment using a straight edge. Adjust position(s) of sheave(s) to achieve parallel alignment within 0.0156 inch.
5. Install new belt on drive motor and bowl assembly sheaves.

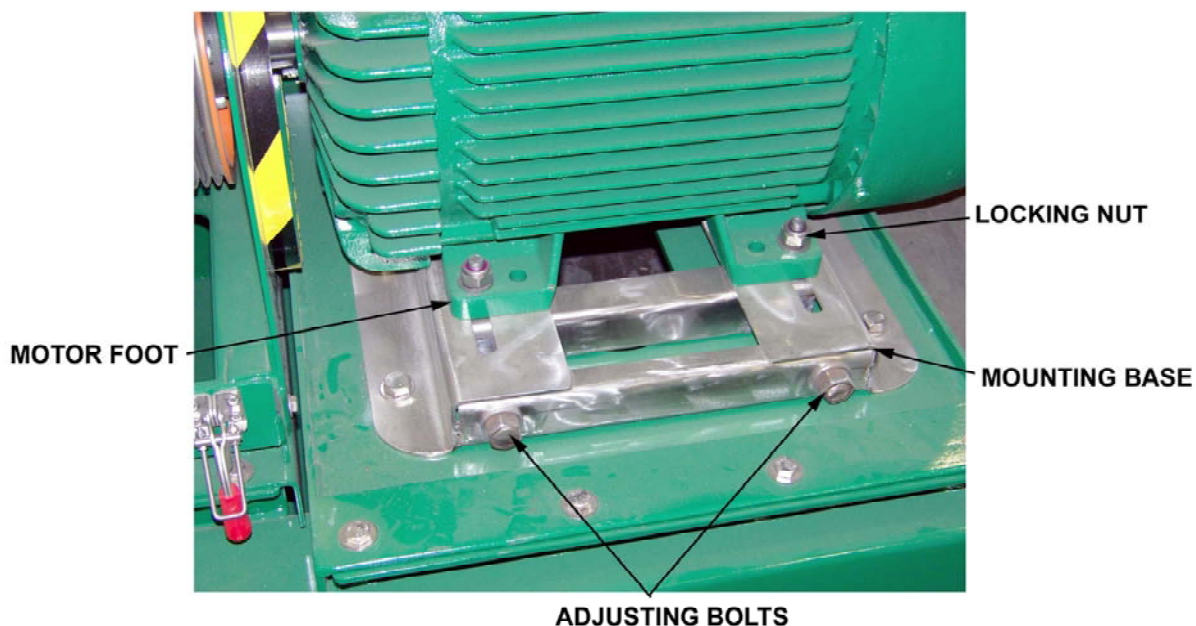


Figure 5022-2 Drive Belt Tensioning Adjustment

Drive Belt (Cont'd)

6. Tighten motor mount adjustment bolts to apply sufficient belt tension to permit deflection of 5/8" with 20 lbs. of pressure exerted at the midpoint of the belt. After correct tension is set, tighten motor mount bolts.
7. Install belt guard, and latch in place.
8. Insert feed tube into feed tube support until shoulder fully contacts support, and tighten screws to specification listed in DER05018.

Rotating Assembly

Maintenance of the rotating assembly requires disassembly and can only be performed with the assembly removed from the case. After removal from the case, the rotating assembly is oriented with the solid end down and placed in the support stand to facilitate removal of the liquid bowl head and conveyor. The following paragraphs describe maintenance procedures for the rotating assembly.

Removal and Disassembly

1. Shut down, lock out, and tag out electric power to the centrifuge.



WARNING! ALWAYS ALLOW MACHINE TO COAST TO A COMPLETE STOP BEFORE OPENING COVER OR REMOVING GUARDS.

2. After bowl assembly has coasted to a full stop, loosen screws securing case cover until screws are disengaged from lower case, and raise cover.
3. Remove feed tube and drive belt.
4. Remove top cover from gearbox enclosure.
5. Remove the gearbox as follows:
 - a. Remove six screws securing gearbox (Figure 5022-3) to flange.
 - b. Install two 3/8"-16 jack screws into gearbox flange clearance holes, and alternately turn both jack screws a few revolutions at a time to begin separating gearbox from flange.
 - c. Support gearbox during remainder of procedure using a lifting strap and suitable hoist.
 - d. Fully separate gearbox from flange by alternately turning jack screws until unit is fully detached.
 - e. With gearbox supported by lifting strap and overhead lifting device, **CAREFULLY** slide gearbox outward until free of splined shaft. Place gearbox in plastic bag to prevent contamination.
6. Tighten nuts on pillow block alignment pins to jack out pins, and remove pins.
7. Remove bolts securing pillow blocks to base mounting pads.
8. Attach lifting straps at two locations on rotating assembly and, using a hoist capable of supporting approximately 2000 pounds, lift and remove rotating assembly from case.



Figure 5022-3 Gearbox Removal

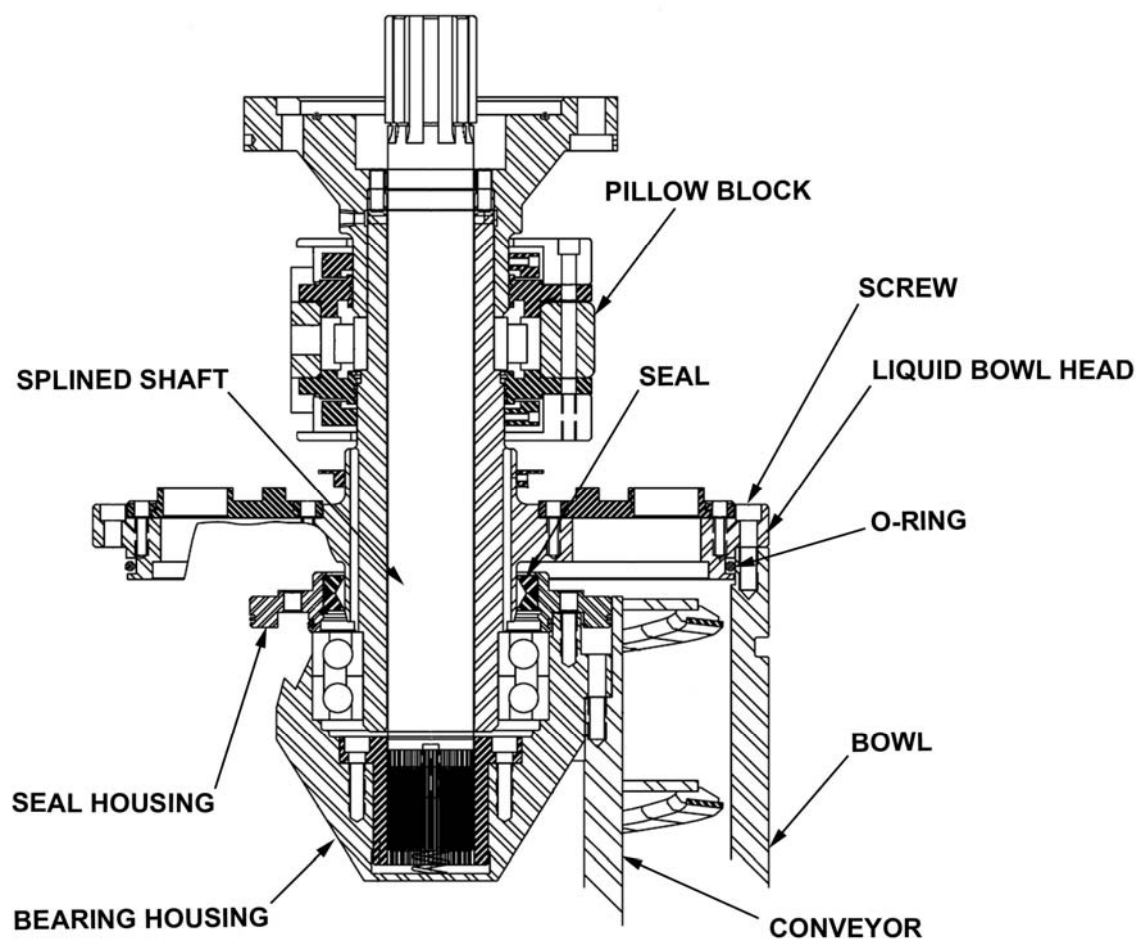
9. Note locations of all shims found between pillow blocks and base mounting pads, and remove and retain shims.
10. Apply protective coating to mating surfaces of pillow blocks and base.
11. Remove liquid bowl head assembly as follows:
 - a. Hoist and orient rotating assembly vertically with solids end down, and insert end into slot in vertical stand (Figure 5022-4) while continuing to support weight with the hoist.



Figure 5022-4 Placing Rotating Assembly Solids End Into Vertical Stand

Removal and Disassembly (Cont'd)

- b. Note locations of alignment marks on liquid bowl head to ensure proper orientation during reassembly.
- c. Remove 12 screws (Figure 5022-5) securing liquid bowl head to bowl assembly.
- d. Thread four jack screws into four threaded jack screw holes in bowl head, and tighten evenly until head has separated from bowl.
- e. Attach a second hoist to liquid bowl head flange, and begin to lift bowl head off bowl with pillow block and splined shaft attached. If bowl head does not fully separate from bowl, lower head down until just enough space remains to insert a pry bar. Carefully pry bowl head evenly until it releases from bowl, and lift and remove bowl head. Remove and discard O-ring from bowl head.

**Figure 5022-5 Liquid Bowl Head Removal**

12. Remove conveyor assembly as follows:

- a. Remove four screws securing liquid end seal housing to conveyor, and using jack screws to separate seal housing from bearing housing, remove seal housing. Discard seal.
- b. Position vertical lifting bracket on conveyor (Figure 5022-6), and secure with four screws.
- c. Attach a hoist capable of lifting at least 750 pounds to vertical lifting bracket.
- d. Slowly lift conveyor from bowl assembly, using care to avoid allowing conveyor to contact interior of bowl.
- e. Orient conveyor horizontally, and place on a support that does not contact tiles.



Figure 5022-6 Attaching Vertical Lifting Bracket To Conveyor

Cleaning, Inspection, and Repair

After removing and disassembling rotating assembly, clean, inspect, and repair as follows:

1. Wash off mud and debris from conveyor and interior and exterior of bowl assembly.
2. Inspect conveyor for missing tiles, distorted or gouged flights, burrs, or other obvious damage. Replace conveyor if serious defects are found.
3. Inspect conveyor feed nozzles for obvious wear. Rotate 180 degrees and reinstall if damage is apparent but not severe. Replace nozzles if found highly damaged. To help preserve dynamic balance, always replace nozzles in pairs that are opposite to each other.
4. Inspect feed accelerator inside conveyor for gouges, fractures, or distortion. If replacement is required, remove three set screws securing feed accelerator and tap from the solid end to remove accelerator.
5. Inspect solids discharge wear inserts on bowl assembly for cracks, fractures, or other damage, and replace if seriously damaged.

Cleaning, Inspection, and Repair (Cont'd)

6. Inspect bowl interior and exterior for gouges, scratches, or other damage that may affect performance.
7. Check pillow block bearings and conveyor bearings for looseness, noise, or rubbing. Replace any defective bearings in accordance with procedure in DER05017.

Reassembly and Installation

Reassembly and installation of the rotating assembly are basically the reverse of removal. Reassemble and install rotating assembly as follows:

1. Prepare and install conveyor into bowl assembly as follows:
 - a. Apply a light coat of grease to bearing seat and seal surfaces of conveyor to facilitate installation.
 - b. With bowl in vertical position on vertical stand, hoist conveyor above bowl and carefully lower into bowl.
 - c. Remove vertical lifting bracket from conveyor.
 - d. Install new seal in seal housing (Figure 5022-5), apply light coat of grease to seal, and install seal housing onto bearing housing. Apply anti-seize compound to screws, insert screws through holes of seal housing and tighten into bearing housing in accordance with DER05018.
2. Install new O-ring in groove of liquid bowl head, apply a light coat of grease to O-ring, and install liquid bowl head onto bowl. Orient bowl head so that alignment marks correspond, and secure liquid bowl head to bowl with screws. Tighten screws in accordance with DER05018.
3. Remove all nicks and/or burrs from pillow blocks and mating surfaces. Clean all surfaces of any protective coating applied after removal.
4. Reinstall shims in proper locations, as noted during removal.
5. Clean alignment pins before reinstalling, and apply anti-seize compound.
6. Orient rotating assembly to horizontal position, and carefully lower into case until about 1/2" above base.
7. Insert bolts through pillow blocks, and start threads into base. Do not tighten bolts.
8. Lower rotating assembly fully onto base.
9. Insert alignment pins through pillow blocks, and lightly tap into holes to fully align pillow blocks with base mounting holes.
10. Tighten bolts in accordance with applicable specification in DER05018 to secure pillow blocks to base.
11. Install gearbox as follows:
 - a. Insert new O-ring into groove in face of gearbox, and attach lifting strap on gearbox. Using an overhead lifting device, **CAREFULLY** position gearbox to engage external spline of splined shaft with internal spline of gearbox.

- b. Insert six new hex head screws through gearbox flange and into threaded mounting holes of gearbox. Alternately turn each screw a few revolutions at a time to evenly draw the gearbox and flange together. Tighten the screws using a star pattern typical for circular bolt patterns. Refer to DER05018 for required torque values.
12. Inject grease into conveyor bearing until grease escapes from drain hole located between pillow block and liquid bowl head. Wipe off surplus grease, and distribute grease by rotating liquid bowl head one revolution clockwise and then one revolution counterclockwise.
13. Check and adjust runout of outside diameter of gearbox as described in the steps below. Axial runout may not exceed 0.002" total indicator reading (TIR). To measure and adjust runout, proceed as follows:
 - a. Clean surface of gearbox where dial indicator plunger will make contact.
 - b. Install indicator holder with magnetic base in either position shown.
 - c. Position plunger of dial indicator into contact with outside diameter at horizontal centerline of gearbox.
 - d. Manually rotate the gearbox until dial indicator is at its lowest reading, and "zero out" dial indicator.
 - e. Manually rotate the gearbox until reading on dial indicator is highest; mark across gearbox and flange along axial centerline where surfaces mate.
 - f. Loosen hex head screw closest to mark as well as both screws to each side of the mark.
 - g. Insert shim having approximate thickness of dial indicator measurement between flange and gearbox. Shim should barely contact threads of screw hole closest to mark made in step e (Figure 5022-7).
 - h. Tighten screws loosened in step f.
 - i. Repeat steps d through h, if required, until TIR does not exceed 0.002".
 - j. Trim projecting shim stock.

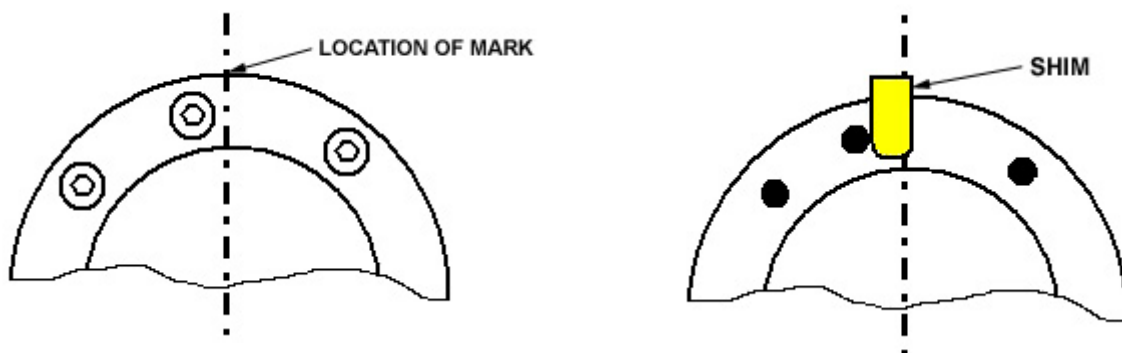


Figure 5022-7 Gearbox Flange Shim Location

Reassembly and Installation (Cont'd)

14. After completing gearbox installation, install top cover over gearbox.
15. Install drive belt, and apply adequate tension to prevent slippage.
16. Install feed tube and secure in its support. Tighten retaining screws in accordance with DER05018.
17. Close cover, and secure by tightening screws in accordance with torque specification in DER05018.

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TOOLS AND EQUIPMENT

DE-1000 CENTRIFUGE

GENERAL

The following tool list includes all tools and equipment supplied to facilitate maintenance of the DE-1000 Centrifuge. Each component is listed with its part number, quantity supplied, and use or application.

TABLE 5102-1 DE-1000 CENTRIFUGE TOOL LIST		
PART NO.	DESCRIPTION / APPLICATION	QTY
Allen 33212	Long-Arm Allen Wrenches, 3/32" to 1/2" <i>Various rotating ass'y hardware</i>	1
Allen 41216	Allen Head Socket, 1/2" x 1/2" Drive <i>Various rotating ass'y hardware</i>	1
Allen 14MM	Allen Wrench, 14 MM <i>Various rotating ass'y hardware</i>	1
OTC-1039	Bearing Puller, 2-Jaw, 10" Reach, 0" to 12" Spread <i>Remove main bearing inner race from liquid bowl head shaft</i>	1
HXCBF038-16X250	Hex Head Jack Bolt, 3/8-16 x 2-1/2" Lg <i>Separate Rotodiff/Gearbox from flange</i>	2
HXCBF031-18X400	Hex Head Jack Bolt, 5/16-18 x 4" Lg <i>Separate conveyor bearing housing from liquid end bowl head shaft</i>	4
HXCBF038-16X400	Hex Head Jack Bolt, 3/8-16 x 4" Lg <i>Separate conveyor bearing housing from solid end bowl head shaft</i>	4
10792-00	Vertical Lifting Bracket <i>Lift conveyor from Liquid Bowl Ass'y</i>	1
10791-00	Vertical Stand <i>Support Liquid Bowl Ass'y vertically during maintenance</i>	1
WFSS-31	5/16" Flat Washers <i>Attach vertical lifting bracket to Rotodiff/Gearbox flange</i>	6
NHHS-31-18	Hex Nut, heavy, 5/16-18 <i>Attach vertical lifting bracket to Rotodiff/Gearbox flange</i>	6
SKCS-38-16x175	Socket Hd Cap Screw, 3/8-16 x 1-3/4" <i>Attach vertical lifting bracket to Rotodiff/Gearbox flange</i>	4

TABLE 5102-1 DE-1000 CENTRIFUGE TOOL LIST

PART NO.	DESCRIPTION / APPLICATION	QTY
RED-B150X125	Bushing, Hex, 1-1/4" x 1-1/2" <i>Reduce opening of feed tube</i>	1
CHE-SRI-2	Grease, Standard* <i>Lubricate main bearings and Rotodiff/Gearbox spline</i>	1
Aeroshell GR-14	Grease, Arctic* <i>Lubricate main bearings and Rotodiff/Gearbox spline</i>	1
EYE-S31-18X113	Eye Bolt, 3/8" x 1-1/8" <i>Lift rotating ass'y by Rotodiff/Gearbox flange</i>	2
PP1127	Grease Gun, 1/2" Dia. Hose, 14.5 Oz <i>Inject grease into Rotodiff/Gearbox and main bearing fittings</i>	2
PP1122	Wrench, Rotodiff <i>Set Rotodiff to rotate in opposite direction</i>	1

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TROUBLESHOOTING

DE-1000 CENTRIFUGE - GEARBOX DRIVE

GENERAL

Although equipment failure is unlikely, malfunctions due to operating error or other problem can result in unnecessary machine down-time and should be corrected as soon as possible. The troubleshooting procedures presented in this section will assist technicians in isolating and correcting malfunctions.

TROUBLESHOOTING PROCEDURE

Fault analysis should proceed logically from the simplest cause to the more complex. The most difficult problem is an unexpected shutdown or inability to start. Always eliminate obvious causes of malfunction before proceeding to more complex possibilities.

Since more than one cause may be responsible for a malfunction, the technician must proceed methodically to eliminate all possible causes and take all corrective actions at each step of the troubleshooting process. Where changes to operating procedures are the best course of action, appropriate recommendations are included.

In general, an unexpected centrifuge shutdown is due to an interruption of electric power that has turned off the 50 HP drive motor. Safety components are installed in key areas of the centrifuge electrical control system to shut down the electric motor if safety parameters such as motor temperature, vibration, or conveyor torque are exceeded. The power interruption may be due to one or more factors, including a local power failure.

The troubleshooting chart consists of failure modes, possible cause(s), and recommended course(s) of action. All electrical continuity checks in this procedure are performed without electric power supplied to the centrifuge. Lock out and tag out equipment before attempting to perform any continuity check.



WARNING! CONTINUITY CHECKS MUST BE PERFORMED WITHOUT ELECTRIC POWER APPLIED TO CENTRIFUGE. LOCK OUT AND TAG OUT ELECTRIC POWER BEFORE ATTEMPTING CONTINUITY CHECKS.

In addition to the troubleshooting chart, the technician should refer to the appropriate schematic and wiring diagrams in Section 11 - Reference Drawings, and description and theory of operation in Section 1 for additional assistance in troubleshooting.

CHECK FOR CLOGGED CONVEYOR

Troubleshooting should begin with determining if the conveyor is clogged. To check for a clogged conveyor, proceed as follows:

1. Shut down and lock out and tag centrifuge.
2. Remove overload release assembly from gearbox, and attempt to turn gearbox pinion shaft while restraining bowl from rotating. If pinion can be turned independently of bowl, conveyor is not clogged.
3. Clear conveyor clogging by flushing with water or steam. If conveyor is not clogged, proceed with troubleshooting steps below.

TROUBLESHOOTING CENTRIFUGE - FULL HYDRAULIC DRIVE	
Possible Cause	Isolation Procedure & Corrective Action
Failure Mode 1: Centrifuge Does Not Start	
No electric power.	Confirm that correct power is supplied to centrifuge and that main contactor is closed. Correct any defects.
Vibration switch tripped.	Press and hold vibration switch reset button, and attempt to re-start centrifuge (refer to Section 4 - Operation). If machine fails to start or shuts down soon after starting, continue troubleshooting.
Over-torque switch not reset after tripping.	Reset overload release and over-torque switch (refer to DER05104). Attempt to start centrifuge (refer to Section 4), and monitor vibration and discharges for any abnormalities. Shut down centrifuge immediately upon discovering any abnormal conditions such as no solids discharge.
Failure Mode 2: Centrifuge Starts, But Shuts Down Soon After Starting	
Vibration switch tripped due to excessive vibration during startup.	Press and hold vibration switch reset button, and attempt re-start of centrifuge (refer to Section 4 - Operation). If machine fails to start or shuts down soon after starting, continue troubleshooting.
Over-torque switch tripped due to excessive conveyor torque.	With centrifuge fully stopped, open cover and inspect bowl interior and conveyor for accumulated solids obstructing rotation. If clogging is evident, water wash bowl and conveyor until liquid discharge is clear of solids. If ambient temperature water fails to clear clogging, attempt to clear with hot water or steam. If flushing fails to clear bowl of solids, remove rotating assembly, remove conveyor, and manually clear all solids from the conveyor and bowl interior. After cleaning, reinstall conveyor in bowl, and reinstall rotating assembly (refer to Section 5 - Maintenance). Re-start centrifuge (refer to Section 4), and monitor vibration and discharges for any abnormalities. Shut down centrifuge immediately upon discovering any abnormal conditions such as no solids discharge, and continue troubleshooting.
Failure Mode 3: Centrifuge Has Automatically Shut Down	
No electric power.	Check that electric power is supplied to centrifuge, and check fuses. Correct power loss; replace any blown fuse(s).
Electrical connections incorrect.	Re-check electrical connections (refer to <u>DER03020</u>), and correct any defects.

TROUBLESHOOTING CENTRIFUGE - FULL HYDRAULIC DRIVE	
Possible Cause	Isolation Procedure & Corrective Action
Failure Mode 3: Centrifuge Has Automatically Shut Down (Cont'd)	
Vibration switch tripped.	Press and hold vibration switch reset button, and attempt to re-start centrifuge (refer to Section 4 - Operation). If machine fails to start or shuts down soon after starting, continue troubleshooting.
Bowl clogged with solids causing over-torque switch to trip due to excessive conveyor torque.	With centrifuge fully stopped, open cover and inspect bowl interior and conveyor for accumulated solids obstructing rotation. If clogging is evident, water wash bowl and conveyor until liquid discharge is clear of solids. If unable to clear bowl of solids, remove rotating assembly, remove conveyor, and manually clear all solids from the conveyor and bowl interior. After cleaning, reinstall conveyor in bowl, and reinstall rotating assembly (refer to Section 5 - Maintenance). Reset overload release and over-torque limit switch (refer to DER05104).
Drive motor overheated and/or starter thermal overloads tripped due to excessive current draw.	Allow sufficient time for overload to reset, and then press centrifuge starter RESET button. Press CENTRIFUGE ON button to attempt re-start of centrifuge. If machine starts, monitor vibration and discharges for any abnormalities. Shut down centrifuge immediately upon discovering any abnormal indications such as no solids discharge. Determine cause of anomaly and correct before attempting to re-start centrifuge.
	With power shut down, and CENTRIFUGE ON button pressed, check for electrical continuity from wire number X1 of CENTRIFUGE ON switch to ground. If an open circuit is found, check control system components for continuity to ground at the following wire numbers: From To If No Continuity X1 2 Press CENTRIFUGE ON & repeat check 2 4 Press RESET buttons & repeat check 4 5 Press vibration switch reset button 5A 6 Allow motor to cool & repeat check If any test fails, replace component between affected test points.
	If continuity is found at all above points, check for continuity from wire number 6 to ground. If continuity is not found, replace centrifuge relay CR1.
	Check for continuity from each motor winding terminal T1, T2, and T3 separately to ground. Replace motor if continuity is not found from any winding to ground. If continuity is found across all windings to ground, repeat all continuity checks to locate defective control system component(s). Replace defective component(s).
	Press centrifuge starter RESET button, and then attempt re-start of centrifuge. If machine starts, monitor vibration and discharges for any abnormalities. Shut down centrifuge immediately upon discovering any abnormal indications such as no solids discharge. Determine cause of anomaly and correct before attempting to re-start centrifuge.

TROUBLESHOOTING CENTRIFUGE - FULL HYDRAULIC DRIVE	
Possible Cause	Isolation Procedure & Corrective Action
Failure Mode 4: Feed Pump Fails to Start	
Feed pump motor overheated due to excessive current draw.	Allow sufficient time for motor to cool, and then press PUMP ON button to attempt re-start of feed pump. If pump starts, adjust feed rate to avoid overloading pump and monitor operation until confident of no recurrence.
Feed pump motor overheated and/or starter thermal overloads tripped due to excessive current draw.	Allow sufficient time for starter overload to cool, and then press pump starter RESET button. Press PUMP ON button to attempt re-start of 12feed pump. If pump starts, adjust feed rate to avoid overloading pump and monitor operation until confident of no recurrence.
Defective pump run relay CR2.	Shut down, lock out, and tag out electric power to centrifuge. Disconnect lead 10 from centrifuge relay CR1, and check for continuity from terminal 10 to ground. If continuity is not found, replace relay.
Failure Mode 5: Excessive Vibration Causes Vibration Switch To Trip	
Drooping of wall cake or dislodged tiles causing bowl imbalance.	With centrifuge fully stopped, open cover and inspect bowl interior and conveyor for accumulated solids on one side of bowl. Water wash bowl and conveyor until liquid discharge is clear of solids. If unable to clear bowl of solids, or if dislodged tiles are found, remove rotating assembly, remove conveyor, and manually clear all solids and dislodged tiles from the conveyor and bowl interior. After cleaning, reinstall conveyor in bowl, and reinstall rotating assembly (refer to Section 5 - Maintenance).
Gearbox misaligned	Shim gearbox in accordance with <i>DER05105 - Preventive Maintenance</i> .
Loose components	Inspect for loose components, and re-tighten as necessary.
Worn bearings	Inspect and replace bearings, if worn.
Flexible connections not installed	Install flexible connections where required.
Failure Mode 6: Incomplete Dryness	
Pond depth too deep.	Adjust liquid discharge ports on bowl head.
Conveyor speed too high.	Reduce conveyor speed.
Feed rate too high.	Reduce feed rate.
Bowl speed too low.	Increase bowl speed.
Failure Mode 7: Unacceptable Clarity Of Discharge Liquid	
Pond depth too shallow	Adjust liquid discharge ports on bowl head.
Feed temperature too high.	Adjust temperature
Degradation of feed.	Check feed particle size. If too large, discontinue feed to centrifuge until feed is satisfactory.

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ADJUSTMENTS

DE-1000 CENTRIFUGE - GEARBOX DRIVE

GENERAL

This section contains procedures for adjusting the overload release assembly torque and removal and replacement of the motor sheave. These procedures should be attempted only by skilled personnel who are trained and qualified to perform advanced mechanical procedures.



WARNING! THESE PROCEDURES ARE TO BE PERFORMED ONLY BY TRAINED, QUALIFIED PERSONNEL. DO NOT PERMIT UNQUALIFIED PERSONNEL TO ATTEMPT THESE PROCEDURES.

MOTOR SHEAVE REPLACEMENT

Changing the motor sheave is done to change the bowl speed. Available sheaves are listed in DER04097 - Operating Instructions. After selecting the desired sheave, use the following procedure to replace the sheave.

1. Shut down, lock out, and tag out centrifuge.



WARNING! TO AVOID SERIOUS PERSONAL INJURY BE SURE EQUIPMENT IS LOCKED OUT, TAGGED OUT, DE-ENERGIZED, AND HAS STOPPED ROTATING BEFORE PERFORMING MAINTENANCE AND/OR ADJUSTMENTS.

2. Loosen screws securing feed tube clamp, and slide out feed tube.
3. Release latches, and remove belt guard covering motor sheave and fluid coupling.
4. Loosen four locking nuts securing motor feet to mounting base (Figure 5104-1).
5. Turn adjusting bolts equally counterclockwise until motor moves sufficiently inward to release belt tension.
6. Slip drive belt off motor sheave.
7. Remove screws securing motor sheave to solid bowl head, and remove sheave.
8. Install new motor sheave on solid bowl head, and secure with hex head screws. Tighten screws to torque specified in *DER05018*.
9. Re-install belt on motor sheave.
10. Tighten motor mount adjustment bolts to apply sufficient belt tension to permit a 5/8" deflection when pressed at the midpoint of the belt. Correct tension will prevent slippage without overloading bearings. After correct tension is set, check sheave alignment by placing a straight edge across the bowl and motor sheaves. Sheaves must be aligned within 0.0156". If not aligned, tighten or loosen one adjustment screw, as required. Once sheave alignment is achieved, tighten all four motor locking nuts to secure motor in place.
11. Re-install belt guard, and engage latches to secure guard in place.

MOTOR SHEAVE REPLACEMENT (CONT'D)

12. Insert feed tube into feed tube support until shoulder fully contacts support, and tighten screws to specification listed in DER05018.

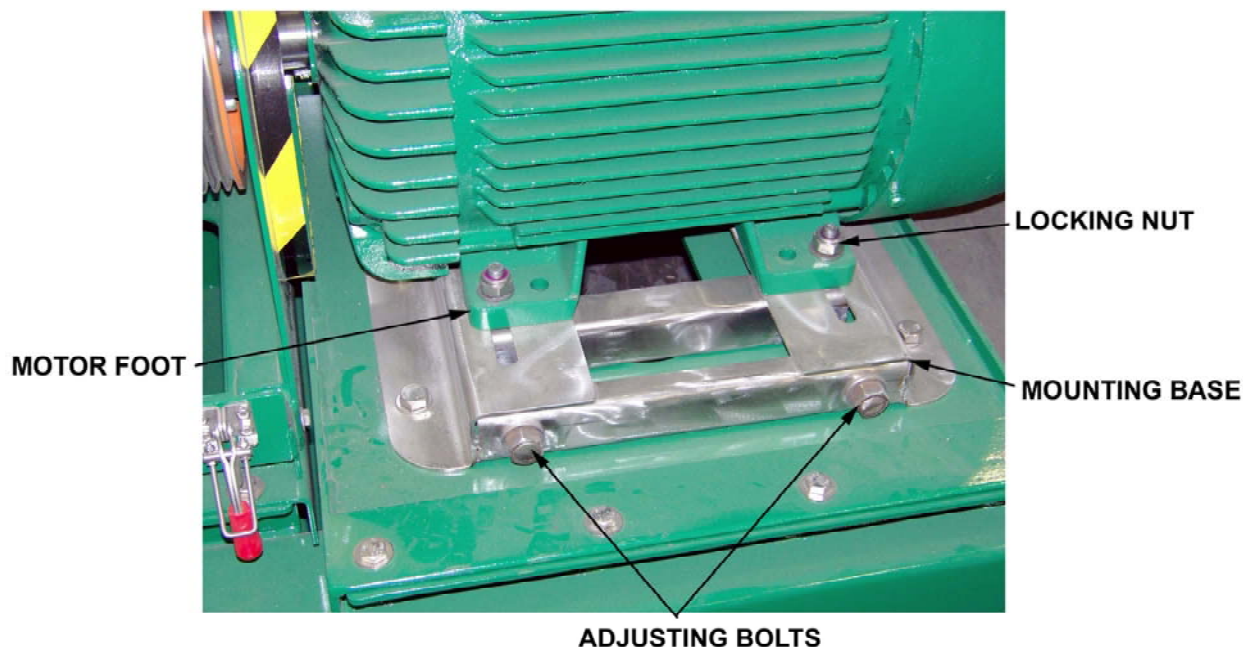


Figure 5104-1 Drive Belt Tensioning Adjustment

Overload Release Clutch Torque

Frequent overload tripping that cannot be corrected by feed rate and/or pond depth adjustments may be due to an incorrect torque setting of the overload release assembly. The release assembly torque should be checked and adjusted, if necessary, as follows:

1. Remove gearbox drive cover.
2. Remove torque cam from overload release clutch.
3. Insert socket key of torque wrench, 13147-00 (included in tool kit 14795-00), into keyway of overload release clutch. Exert sufficient force on torque wrench in a clockwise direction (when facing clutch) to release the clutch. Release should occur at 335 in. lbs. for 52:1 gearbox or 200 in. lbs. for a 125:1 gearbox.
4. Reset clutch as follows:
 - a. Rotate clutch hub until cam roll pin hole and hub keyway are aligned with set screw hole (stamped 22 on overload clutch housing).
 - b. Turn T-handle reset screw (Figure 5014-2) clockwise (inward) approximately 2-1/2 turns until a click is heard, indicating that the clutch is reset.



CAUTION! When Turning Reset Screw Clockwise, Do Not Exceed Three Turns After Slight Resistance Is Felt, As Excessive Tightening May Damage The Clutch's Internal Components.

- c. Check that clutch has reset by attempting to rotate the cam/hub assembly. If rotation is possible, repeat steps a and b, above.



CAUTION! In the following step, T-Handle Reset Screw Must Be Backed Out Fully To Its Original Position Before Returning Centrifuge To Service.

- d. After confirming that the clutch is reset, return the T-handle set screw to its original position by turning counterclockwise (outward).
- e. Return over-torque limit switch roller into contact with torque cam.

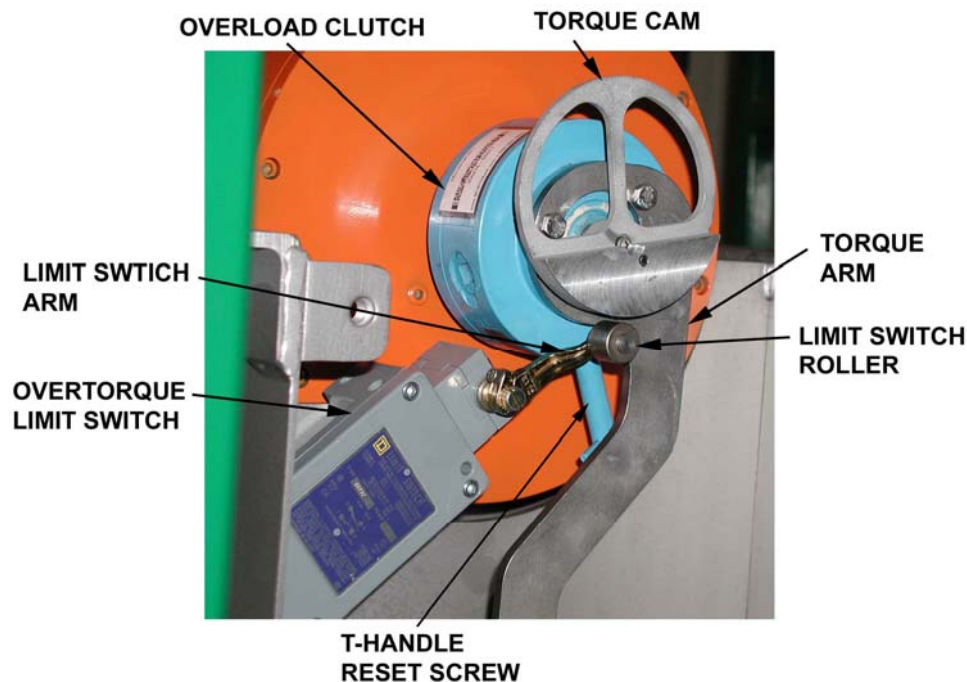


Figure 5014-2 Overload Release Clutch Components

5. If required torque is less than the value specified in step 3, above, increase torque by turning adjustment screw (Figure 5014-3) clockwise until flush with the next milled depth on the clutch housing and scribed lines are aligned; then re-check torque. Do not increase torque setting beyond 335 in. lbs. for a 52:1 gearbox or 200 in. lbs. for a 125:1 gearbox.



WARNING! AN EXCESSIVE TORQUE SETTING CAN RESULT IN DAMAGE TO CENTRIFUGE. DO NOT SET CLUTCH TO RELEASE AT A HIGHER SETTING THAN 335 IN. LBS. FOR 52:1 GEARBOX OR 200 IN. LBS. FOR 125:1 GEARBOX.

Overload Release Clutch Torque (Cont'd)

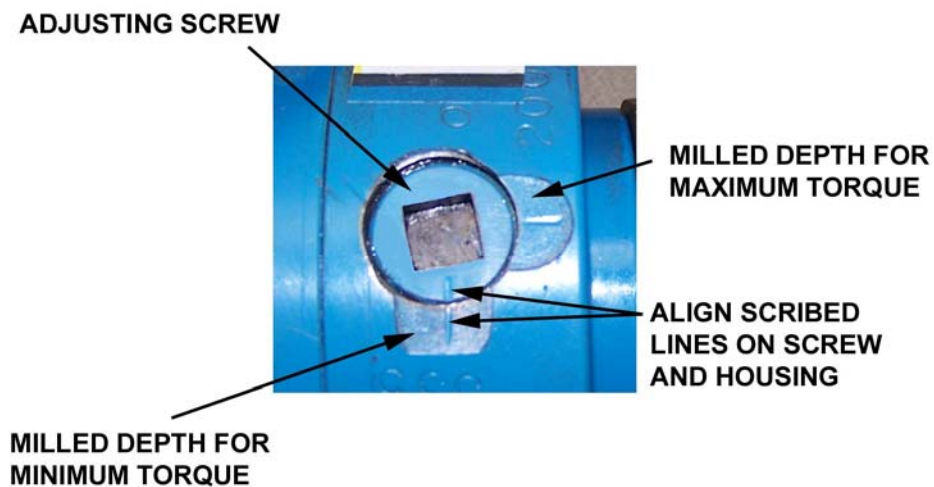


Figure 5014-3 Setting Overload Release Torque

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REFERENCE DRAWINGS

DE-1000 GBD CENTRIFUGE

This section contains Derrick engineering drawings FOR REFERENCE ONLY. For assistance in troubleshooting, repair, and parts ordering, please refer to your Derrick manual.

DE-1000 GBD CENTRIFUGE	
<u>13744-00-001</u> -	General Arrangement - DE-1000 GBD Centrifuge
<u>9587-00-001</u> -	Rotating Assembly - DE-1000 GBD Centrifuge (Radial Flow)
<u>9587-00-003</u> -	Rotating Assembly - DE-1000 FHD Centrifuge (Axial Flow)
<u>11372-01</u> -	Gear Unit - DE-1000 GBD Centrifuge - 52:1
<u>11372-02</u> -	Gear Unit - DE-1000 GBD Centrifuge - 125:1
<u>10147-00</u> -	Electrical Control Schematic - DE-1000 GBD Centrifuge
<u>10141-00-001</u> -	Electrical Wiring Diagram - DE-1000 GBD Centrifuge
<u>10647-00-002</u> -	Lubrication & Maintenance Schedule - DE-1000 Centrifuge
<u>10785-00-006</u> -	Electrical Conduit/Cable Diagram
<u>11171-00</u> -	High Voltage Schematic - DE-1000 Centrifuge (50/60 Hz)
<u>13275-00-004</u> -	Control Box Assembly - DE-1000 GBD Centrifuge
<u>14894-00</u> -	Rotating Assembly - Hardware Parts List

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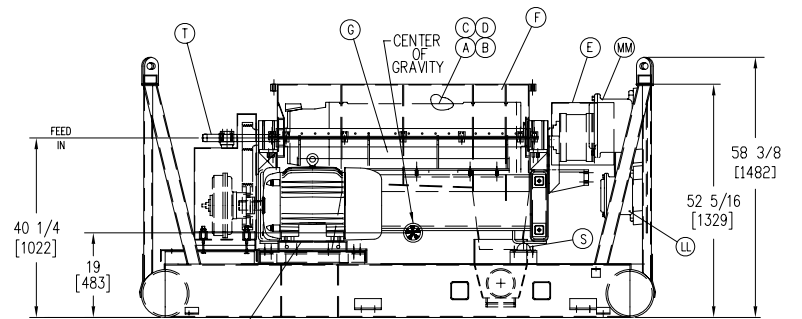
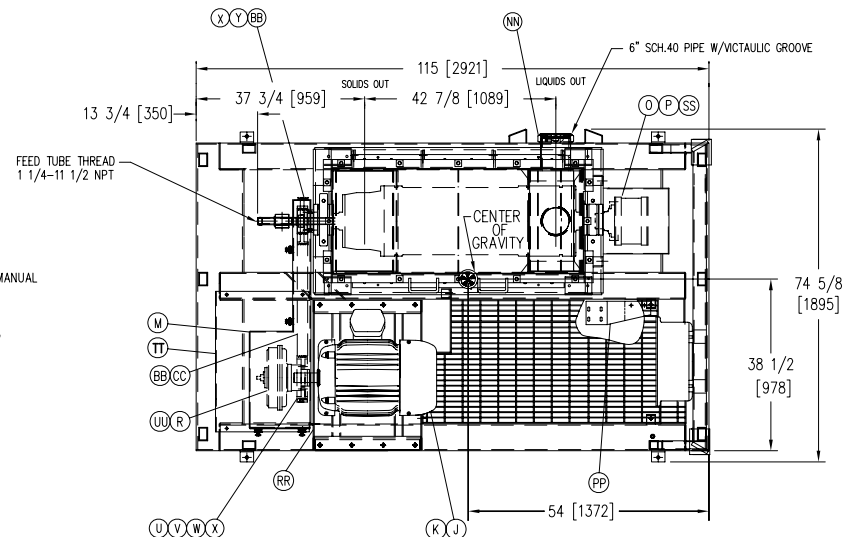
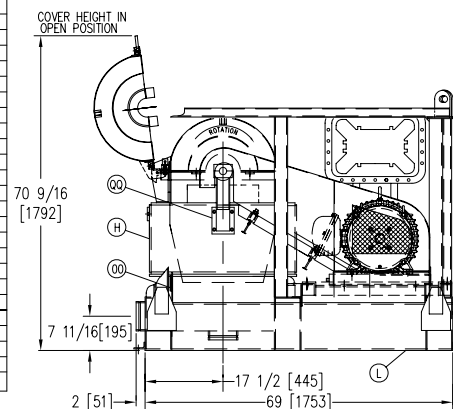
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1	1	1	UU	FLUID COUPLING	TF13KSD
1	1	1	TT	BELT GUARD MOUNTING PAN	13697-00
*	*	*	SS	GEAR UNIT 22:1	13224-00
1	1	1	RR	MOTOR MOUNT	13129-00
1	1	1	QQ	FEED TUBE SUPPORT	9539-01
1	1	1	PP	ELECTRICAL CONDUIT SUPPORT	12256-27
1	1	1	OO	SOLIDS SAMPLE DOOR	13327-00
1	1	1	NN	6" VICTAULIC COUPLING	VIC-6-75
1	1	1	MM	TOP CONTROL BOX ASSEMBLY	13275-00-004
1	1	1	LL	BOTTOM CONTROL BOX ASSEMBLY	13276-00
*	*	*	KK	HUB SHEAVE - 11.1" (2750 R.P.M.)	10603-06 *SEE MANUFACTURING SHEET*
*	*	*	JJ	HUB SHEAVE - 9.0" (2250 R.P.M.)	10603-05
*	*	*	HH	HUB SHEAVE - 8.0" (2000 R.P.M.)	10603-04
*	*	*	GG	HUB SHEAVE - 13.1" (3250 R.P.M.)	10603-04
*	*	*	FF	HUB SHEAVE - 11.5" (2850 R.P.M.)	10603-03
*	*	*	EE	HUB SHEAVE - 10.6" (2600 R.P.M.)	10603-02
*	*	*	DD	HUB SHEAVE - 9.9" (2450 R.P.M.)	10603-01
*	*	*	CC	DRIVE BELT	BELT-5G3V-1060 *SEE NOTE 5, 6*
*	*	*	BB	DRIVE BELT	BELT-5G3V-1000 *SEE NOTE 5, 6*
*	*	*	AA	HUB SHEAVE - 13.1" (4000 R.P.M.)	10603-04 *SEE MANUFACTURING SHEET*
*	*	*	Z	HUB SHEAVE - 11.5" (3500 R.P.M.)	10603-03
*	*	*	Y	HUB SHEAVE - 11.1" (3400 R.P.M.)	10603-06
*	*	*	X	HUB SHEAVE - 10.6" (3225 R.P.M.)	10603-02
*	*	*	W	HUB SHEAVE - 9.9" (3000 R.P.M.)	10603-01
*	*	*	V	HUB SHEAVE - 9.0" (2750 R.P.M.)	10603-05
*	*	*	U	HUB SHEAVE - 8.0" (2450 R.P.M.)	10603-00 *SEE MANUFACTURING SHEET*
1	1	1	T	FEED TUBE	9540-00
4	4	4	S	ISOLATOR MOUNTS	CA1595X1/2-6
1	1	1	R	FLUID COUPLING	TF12KSD
1	1	1	Q	SLIDING MOTOR BASE	PER MOTOR
*	*	*	P	GEAR UNIT 52:1	13223-01
*	*	*	O	GEAR UNIT 125:1	13223-00
1	1	1	N	TOOL KIT	10795-00
1	1	1	M	BELT GUARD	9847-00-002
1	1	1	L	SKID	13100-00
1	1	1	K	MOTOR-50HP 380/50/3; 1475 RPM	BAL-M7064T-150 *SEE NOTE 6*
1	1	1	J	MOTOR-50HP 460/60/3; 1750 RPM	BAL-M7064T-1 *SEE NOTE 6*
1	1	1	H	BASE	9589-00
1	1	1	G	LOWER CASE	9590-02
1	1	1	F	CASE COVER	9591-02
1	1	1	E	GEAR UNIT GUARD	9856-00-001
*	*	*	D	ROTATING ASSEMBLY (HARD SURFACED)	9587-59-003 *SEE MANUFACTURING SHEET*
*	*	*	C	ROTATING ASSEMBLY W/TILES	9587-00-003 *SEE MANUFACTURING SHEET*
*	*	*	B	ROTATING ASSEMBLY (HARD SURFACED)	9587-59-001 *SEE MANUFACTURING SHEET*
*	*	*	A	ROTATING ASSEMBLY W/TILES	9587-00-001 *SEE MANUFACTURING SHEET*
03				AXIAL CENTRIFUGE ASSEMBLY (50HZ)	13744-03-001
02				AXIAL CENTRIFUGE ASSEMBLY (60HZ)	13744-02-001
01				RADIAL CENTRIFUGE ASSEMBLY (50HZ)	13744-01-001
00				RADIAL CENTRIFUGE ASSEMBLY (60HZ)	13744-00-001
QTY.			No.	PART NAME	DESCRIPTION

* DESIGNATES AVAILABLE OPTIONS. FOR SPECIFIC INFORMATION PERTAINING TO EQUIPMENT PURCHASED, REFERENCE CENTRIFUGE ORDER INFORMATION SHEET SUPPLIED IN CUSTOMER MAINTENANCE AND OPERATIONS MANUAL.

NOTES:

- ONE (1) UNIT COMPLETE
- COATING TYPE: SYSTEM ZRE/UE
- LUBRICATION: SEE MANUFACTURING SHEET IN MANUAL
 - MAIN BEARINGS - PER APPLICATION
 - CONVEYOR BEARINGS - PER APPLICATION
 - GEAR BOX - PER APPLICATION
 - DRIVE CLUTCH - PER APPLICATION
 - TORQUE OUT ASSEMBLY - PER APPLICATION
- OPERATING SPEED(S) - SEE MANUFACTURING SHEET IN MANUAL
- DRIVE BELT SELECTION -
 - BELT-5G3V-1000 TO BE USED WITH SHEAVES
 - * 10603-00, 10603-01, 10603-02, & 10603-05
 - BELT-5G3V-1060 TO BE USED WITH SHEAVES
 - * 10603-03, 10603-04, & 10603-06
- MOTORS ARE EXPLOSION PROOF
- FLANGE ADAPTER KIT - G0004029
- 3/4" ANCHOR SHACKLE (4 REQ'D) - G0004072



APPROX WT 6860 LBS

DIMENSIONS IN [] = MILLIMETERS

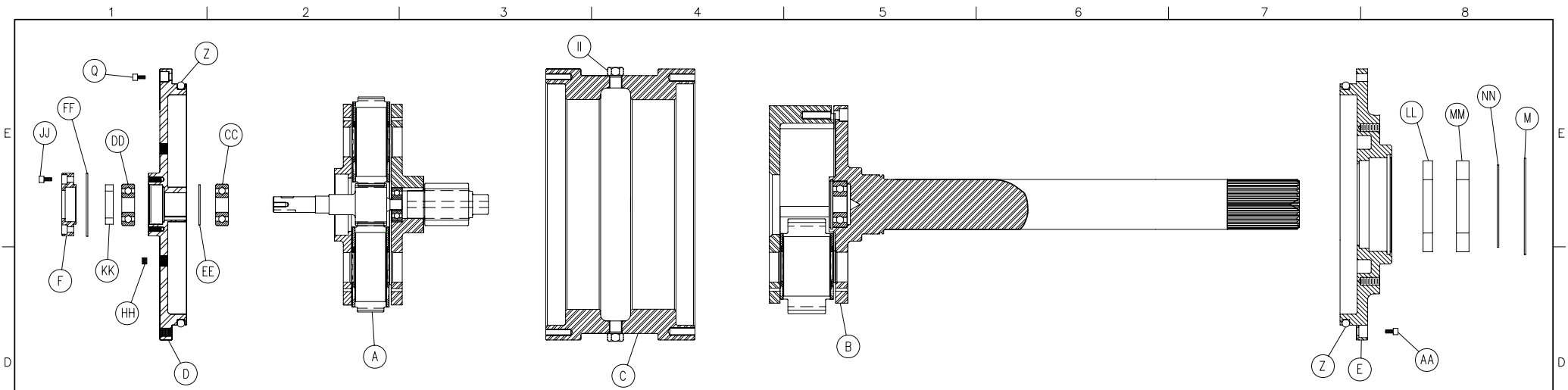
REFERENCE DRAWINGS	
ELECTRICAL CONDUIT	10785-00-001
ELECTRICAL SCHEMATIC (LOW VOLTAGE)	10147-00
ELECTRICAL SCHEMATIC (HIGH VOLTAGE)	11171-00
ELECTRICAL WIRING DIAGRAM	10141-00-001
LUBRICATION & MAINTENANCE	10647-00-002

10785-00-001 WAS 10785-00-003, BAL-M7064T-1 WAS BAL-M7064T-1, BAL-M7064T-150 WAS BAL-M7064T-150, 13275-00-004 WAS 13275-00-002, NOTE 7 WAS (UNIT HAS REMOTE HOUR METER), NOTE 7 WAS NOTE 8, NOTE 8 WAS NOTE 9.				NVB	6/11/02	TITLE GENERAL ARRANGEMENT DE1000™ GBD CENTRIFUGE		FIG 1.2	
REV	CHANGE	OK'D	DATE	OWN		TOC	DATE	SCALE	REV
1							10/16/97	1=20	
C20	N						BA 8/13/01		
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				3744-00-001				DERRICK CORPORATION 590 DUKE ROAD, BUFFALO, NY 14225 U.S.A.	

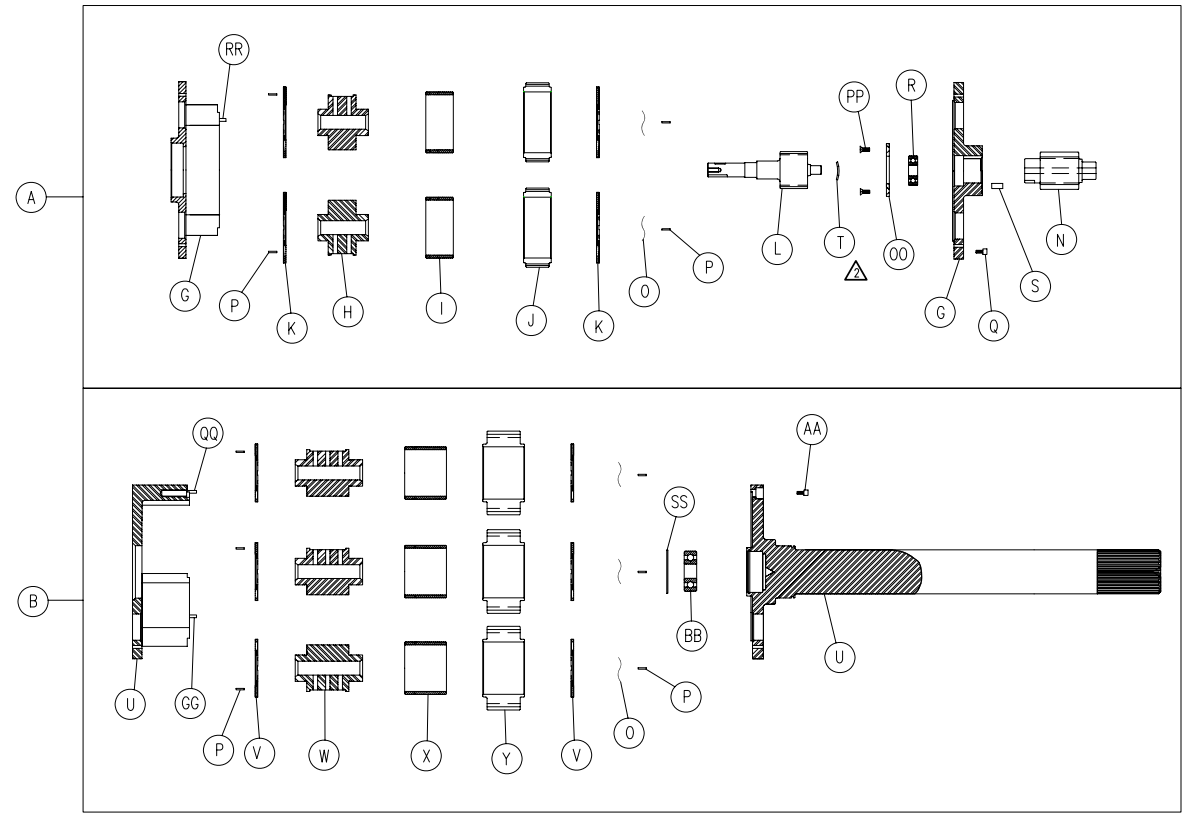


B

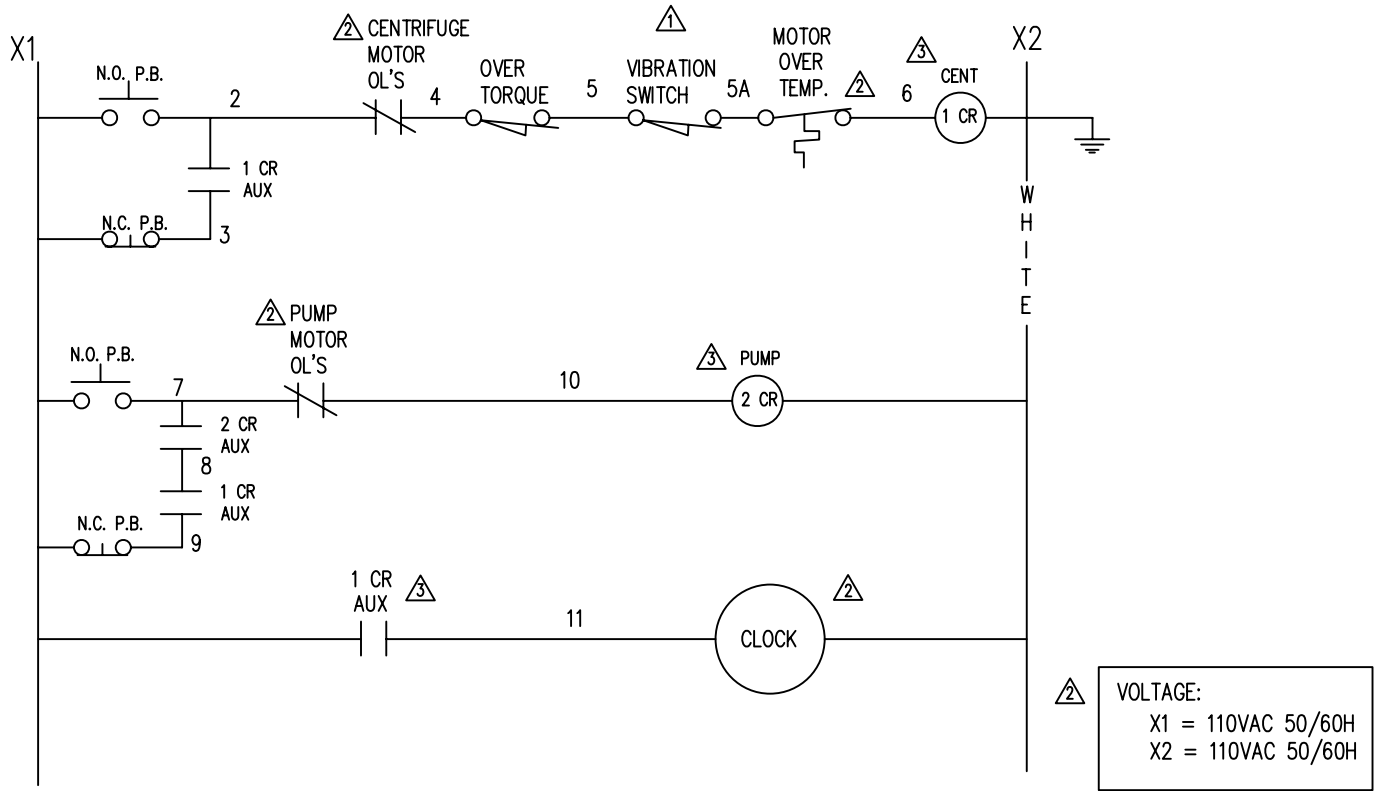
ITEM 42 SPEC. NO. 800-00	REV	1/26/96
ITEM 50 WAS CSD-404-42N-42N ASSESS FOR	REV	2/15/96
ADD ITEM 51 TO THE 50 ITEM QTY AND ITEM 52 TO QTY AND 53 TO QTY TO REFLECT NEW QTY. MAKE SURE TO REFLECT QTY TO QTY AND 53 TO QTY TO REFLECT NEW QTY.	REV	10/5/02
REV	QTY	DATE
<p>THE DESIGN AND INFORMATION CONTAINED ON THIS DRAWING OR COVERED HEREIN ARE THE EXCLUSIVE PROPERTY OF DERRICK CORPORATION. ANY REUSE, REPRODUCTION, OR MODIFICATION OF THIS DRAWING OR COVERED HEREIN WITHOUT THE WRITTEN PERMISSION OF DERRICK CORPORATION IS PROHIBITED. ANY REUSE, REPRODUCTION, OR MODIFICATION OF THIS DRAWING OR COVERED HEREIN WITHOUT THE WRITTEN PERMISSION OF DERRICK CORPORATION IS PROHIBITED.</p>		
<p>CENTRIFUGE - ROTATING ASSEMBLY FOR FLOW DER-1000" X 24" FLOW KWN JWS TS 265/274/292 NAME 1=4,1=2 04 Y 00 JWS 17/93 9387-00-003 5000 DOW ROAD BUFFALO, NY 14205 U.S.A.</p>		



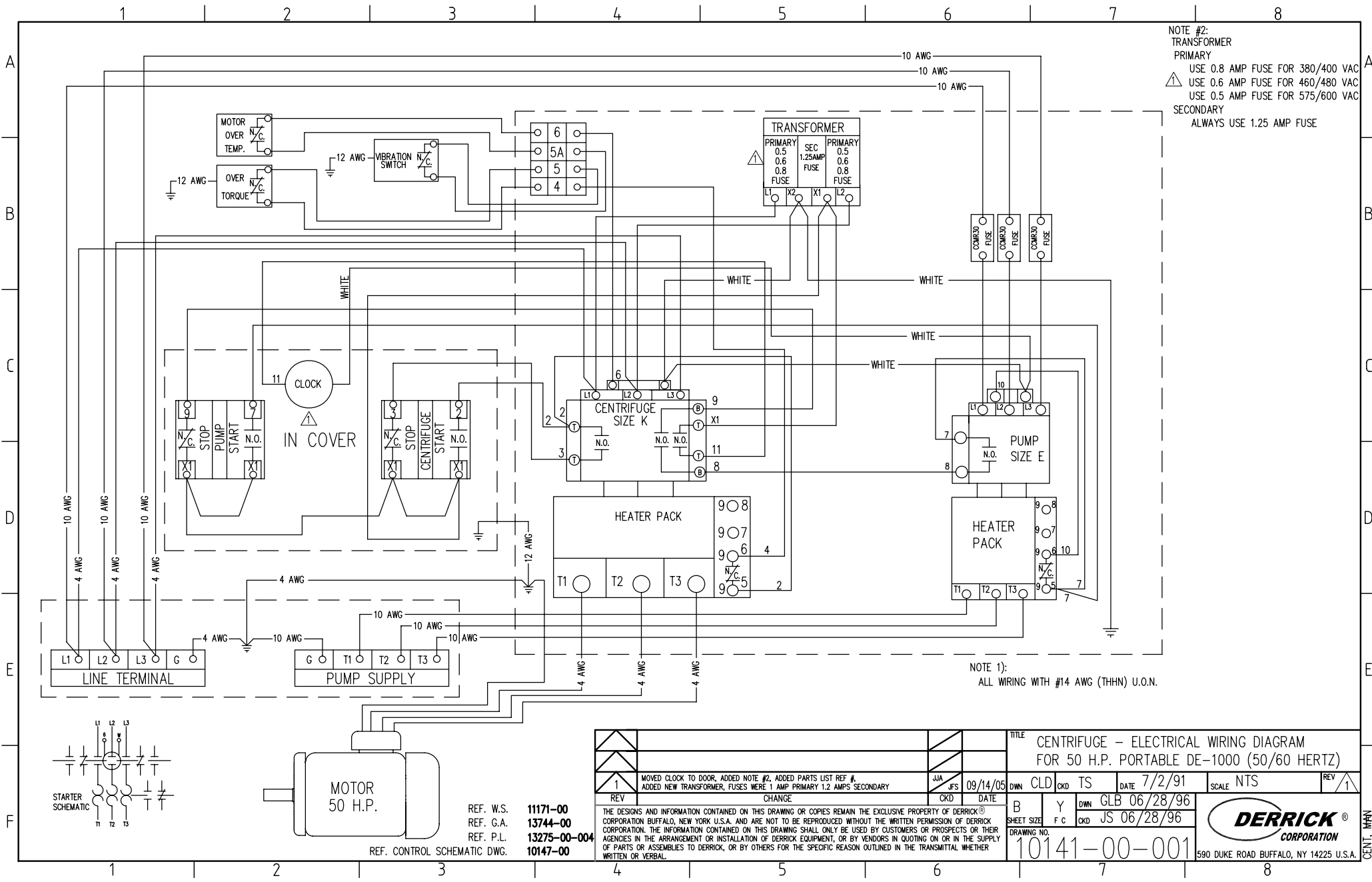
1	2	SS	RETAINING RING	CS10-GU-319-00
2	1	RR	DOWEL PIN	PP1361
2	1	QQ	DOWEL PIN	PP1362
2	1	PP	MACHINE SCREW	G0003040
1	1	OO	RETAINER PLATE	11033-00
1	1	NN	RETAINING RING	CS10-GU-318-00
1	1	MM	SHELL REAR COVER BEARING	CS10-GU-508-00
1	1	LL	SHELL REAR COVER SEAL	SEAL-0287-03631
1	1	KK	SHELL FRONT COVER SEAL	CS10-GU-308-00
4	1	JJ	HEX HEAD CAP SCREW	HXCS-10-24X75-8
2	1	II	PLUG w/O-RING	IMP-721FS0-5
2	1	HH	PIPE PLUG	SHPP-13
1	1	GG	DOWEL PIN	PP1354
1	1	FF	SEAL HOUSING GASKET	11373-00
1	1	EE	BEARING SPACER RING	11374-00
1	1	DD	FIRST STAGE SUN GEAR BEARING	CS10-GU-505-00
1	1	CC	BEARING - FIRST STAGE	CS10-GU-507-00
1	1	BB	BEARING - SECOND STAGE	CS10-GU-506-00
9	8	AA	HEX HEAD CAP SCREW	HXCS-31-18X75-8
2	2	Z	O-RING	CS10-GU-309-00
3	1	Y	SECOND STAGE PLANET GEAR	11099-00
3	1	X	SECOND STAGE JOURNAL BUSHING	11353-02
3	1	W	SECOND STAGE JOURNAL	10988-00
6	1	V	SECOND STAGE THRUST WASHER	11028-00
1	1	U	CAGE AND CARRIER - SECOND STAGE	1329700B
1	1	T	BELVILLE WASHER	PP1364
1	1	S	KEY - 1/4 X 1/2	11375-00
1	1	R	FIRST STAGE INNER BEARING	CS10-GU-503-00
8	8	Q	HEX HEAD CAP SCREW	HXCS-25-20X63-8
4	4	P	DOWEL PIN	PP1365
3	2	O	WAVEY SPRING WASHER	PP1363
1	1	N	SECOND STAGE SUN GEAR	11101-00
1	1	M	RETAINING RING	CS10-GU-317-00
1	1	L	FIRST STAGE SUN GEAR	11100-00
4	4	K	FIRST STAGE THRUST WASHER	10996-00
2	2	J	FIRST STAGE PLANET GEAR	11098-00
2	2	I	FIRST STAGE JOURNAL BUSHING	11353-01
2	2	H	FIRST STAGE JOURNAL	10987-00
1	1	G	CAGE AND CARRIER - FIRST STAGE	1329900B
1	1	F	SEAL HOUSING	11029-00
1	1	E	SHELL REAR COVER	10905-00
1	1	D	SHELL FRONT COVER	10986-00
1	1	C	SHELL	10995-00
1	1	B	COMPLETE STAGE TWO ASSY	
1	1	A	COMPLETE STAGE ONE ASSY	
1	1	01	COMPLETE GEAR UNIT	



REV		DATE		DW		WS		TS		DATE		SCALE		REV	
1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2
ITEM 1 QUANTITY WAS 2.		MGR		1/30/07		C		Y		DWN		DJS		1/30/98	
UPDATED DRAWING NUMBERS.		MGR		4/3/01		C		Y		DWN		DJS		1/30/98	
CHANGE		MGR		4/3/01		C		Y		DWN		DJS		1/30/98	
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DERRICK CORPORATION		590 DUKE ROAD, BUFFALO, NY 14225 U.S.A.													



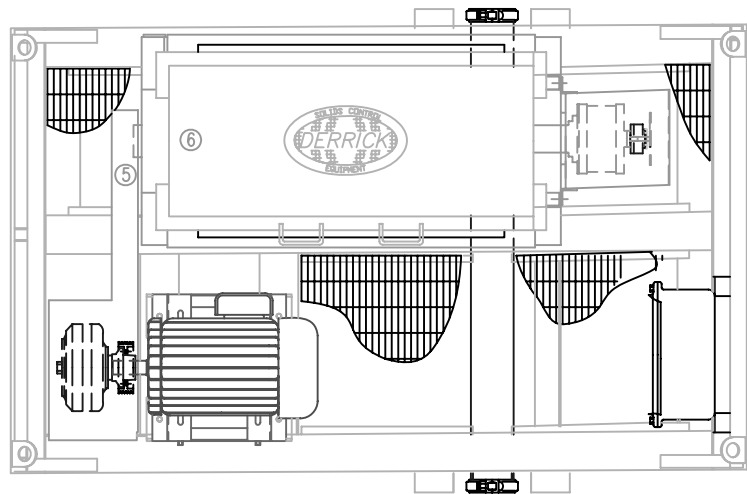
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				590 DUKE ROAD		BUFFALO, NEW YORK 14225 U.S.A.	
3	ADDED CONTACT RELAY; ADDED PUMP & CENT DESCRIPTION	KW	9/24/93	TITLE CENTRIFUGE- ELECTRICAL CONTROL SCHEMATIC FOR 50 H.P. PORTABLE DE-1000 (50 HERTZ & 60 HERTZ)			
2	ADDED 50 H.P. PORTABLE DE-1000 (460/60/3) TO TITLE; CLOCK WAS SELF POWERED W/BATTERIES & IS OBSOLETE; ADDED NEW CLOCK WIRING	KW	1/6/93	DWN	CLD	CKD	TS
	CORRECTED OVER TEMP DIAGRAM; SPECIFIED MOTOR OVER LOADS; ADDED VOLTAGE INFORMATION	WS	6/17/92	DATE	7/8/91	SCALE	NTS
1	ADDED VIBRATION SWITCH,	TS	00A	Y	DRAWING NO.	10147-00	FIG: 2.1
REV	CHANGE	CKD	DATE	D B	F C	FIGURE NO	3 REV



NOTE #2:
TRANSFORMER
PRIMARY
USE 0.8 AMP FUSE FOR 380/400 VAC
USE 0.6 AMP FUSE FOR 460/480 VAC
USE 0.5 AMP FUSE FOR 575/600 VAC
SECONDARY
ALWAYS USE 1.25 AMP FUSE

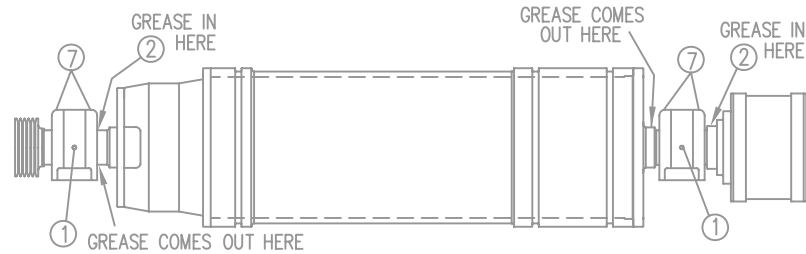
NOTE 1):
ALL WIRING WITH #14 AWG (THHN) U.O.N.

1		CENTRIFUGE - ELECTRICAL WIRING DIAGRAM FOR 50 H.P. PORTABLE DE-1000 (50/60 HERTZ)		DATE 7/2/91		SCALE NTS		REV 1	
REV		CHANGE		DATE		SHEET SIZE		DRAWING NO.	
1		MOVED CLOCK TO DOOR, ADDED NOTE #2, ADDED PARTS LIST REF #. ADDED NEW TRANSFORMER, FUSES WERE 1 AMP PRIMARY 1.2 AMPS SECONDARY		09/14/05		B Y		10141-00-001	
2		THE DESIGNS AND INFORMATION CONTAINED ON THIS DRAWING OR COPIES REMAIN THE EXCLUSIVE PROPERTY OF DERRICK CORPORATION. THE INFORMATION CONTAINED ON THIS DRAWING SHALL ONLY BE USED BY CUSTOMERS OR PROSPECTS OR THEIR AGENCIES IN THE ARRANGEMENT OR INSTALLATION OF DERRICK EQUIPMENT, OR BY VENDORS IN QUOTING ON OR IN THE SUPPLY OF PARTS OR ASSEMBLIES TO DERRICK, OR BY OTHERS FOR THE SPECIFIC REASON OUTLINED IN THE TRANSMITTAL WHETHER WRITTEN OR VERBAL.		JJA JFS		DWN GLB 06/28/96		DERRICK CORPORATION	
3		CORPORATION BUFFALO, NEW YORK U.S.A. AND ARE NOT TO BE REPRODUCED WITHOUT THE WRITTEN PERMISSION OF DERRICK CORPORATION. THE INFORMATION CONTAINED ON THIS DRAWING SHALL ONLY BE USED BY CUSTOMERS OR PROSPECTS OR THEIR AGENCIES IN THE ARRANGEMENT OR INSTALLATION OF DERRICK EQUIPMENT, OR BY VENDORS IN QUOTING ON OR IN THE SUPPLY OF PARTS OR ASSEMBLIES TO DERRICK, OR BY OTHERS FOR THE SPECIFIC REASON OUTLINED IN THE TRANSMITTAL WHETHER WRITTEN OR VERBAL.		CKD		F C		590 DUKE ROAD BUFFALO, NY 14225 U.S.A.	
4		CENTRIFUGE - ELECTRICAL WIRING DIAGRAM		09/14/05		DWN GLB 06/28/96		DERRICK CORPORATION	
5		FOR 50 H.P. PORTABLE DE-1000 (50/60 HERTZ)		09/14/05		DWN GLB 06/28/96		DERRICK CORPORATION	
6		CENTRIFUGE - ELECTRICAL WIRING DIAGRAM		09/14/05		DWN GLB 06/28/96		DERRICK CORPORATION	
7		FOR 50 H.P. PORTABLE DE-1000 (50/60 HERTZ)		09/14/05		DWN GLB 06/28/96		DERRICK CORPORATION	
8		CENTRIFUGE - ELECTRICAL WIRING DIAGRAM		09/14/05		DWN GLB 06/28/96		DERRICK CORPORATION	

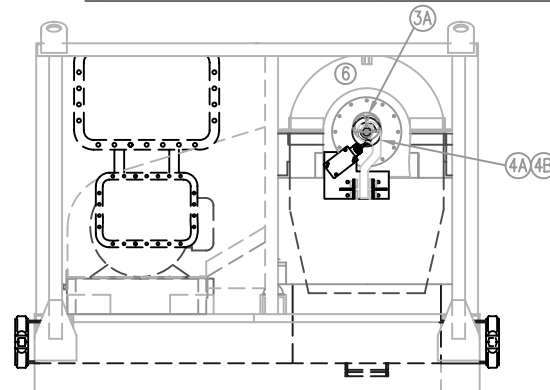
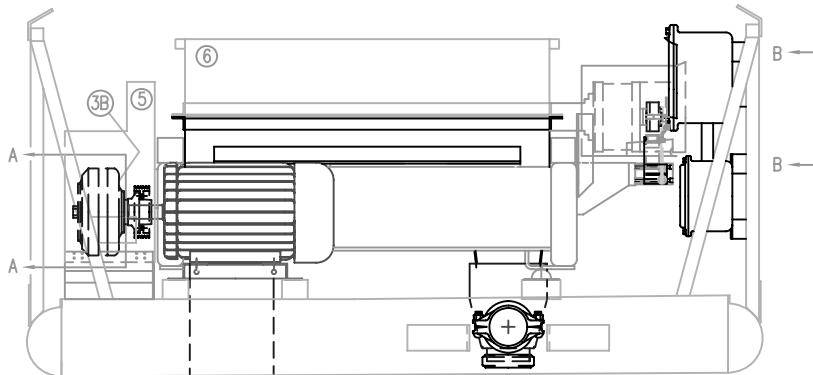


BELT DRIVE ONLY

HYDRAULIC DRIVE ONLY



LUBRICATION & MAINTENANCE SCHEDULE		
MAINTENANCE OPERATIONS	SERVICE INTERVAL	LUB. TYPE (OTHER)
1) GREASE MAIN BEARINGS	1 SHOT DAILY	REFER TO B 1.1
2) PURGE CONVEYOR BEARINGS	BI-WEEKLY	REFER TO B 1.1
3) CHECK FLUID LEVELS:		
A) GEAR BOX HOLE @ 12:00	BI-WEEKLY	REFER TO B 1.1
B) DRIVE CLUTCH HOLE	BI-WEEKLY	REFER TO B 1.1
4) TORQUE OUT ASSEMBLY		
A) CHECK TORQUE SETTING	250 HRS	REFER TO MANUAL
B) GREASE	1000 HRS	REFER TO MANUAL
5) CHECK BELT TENSION	BI-WEEKLY	20lbs. @ 1/2"
	INITIAL BREAK-IN	30lbs. @ 1/2"
6) CHECK CASE FOR SOLIDS	WEEKLY	VISUAL
7) CLEAN OUT UNDER FLINGER COVERS	MONTHLY	VISUAL
8) CHECK HYDRAULIC FLUID IN TANK	WEEKLY	REFER TO MANUAL

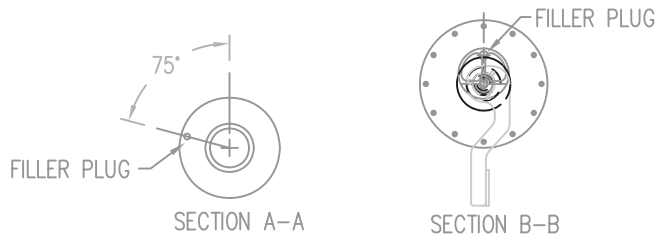


*MIXING LUBRICANTS MAY CAUSE
CATASTROPHIC FAILURE

*DRAIN & REPLACE ALL FLUIDS EVERY
120 DAYS OR 1800 HRS. OF USE*

REF 10500-00

DWN: CK 06/27/97
CKD:



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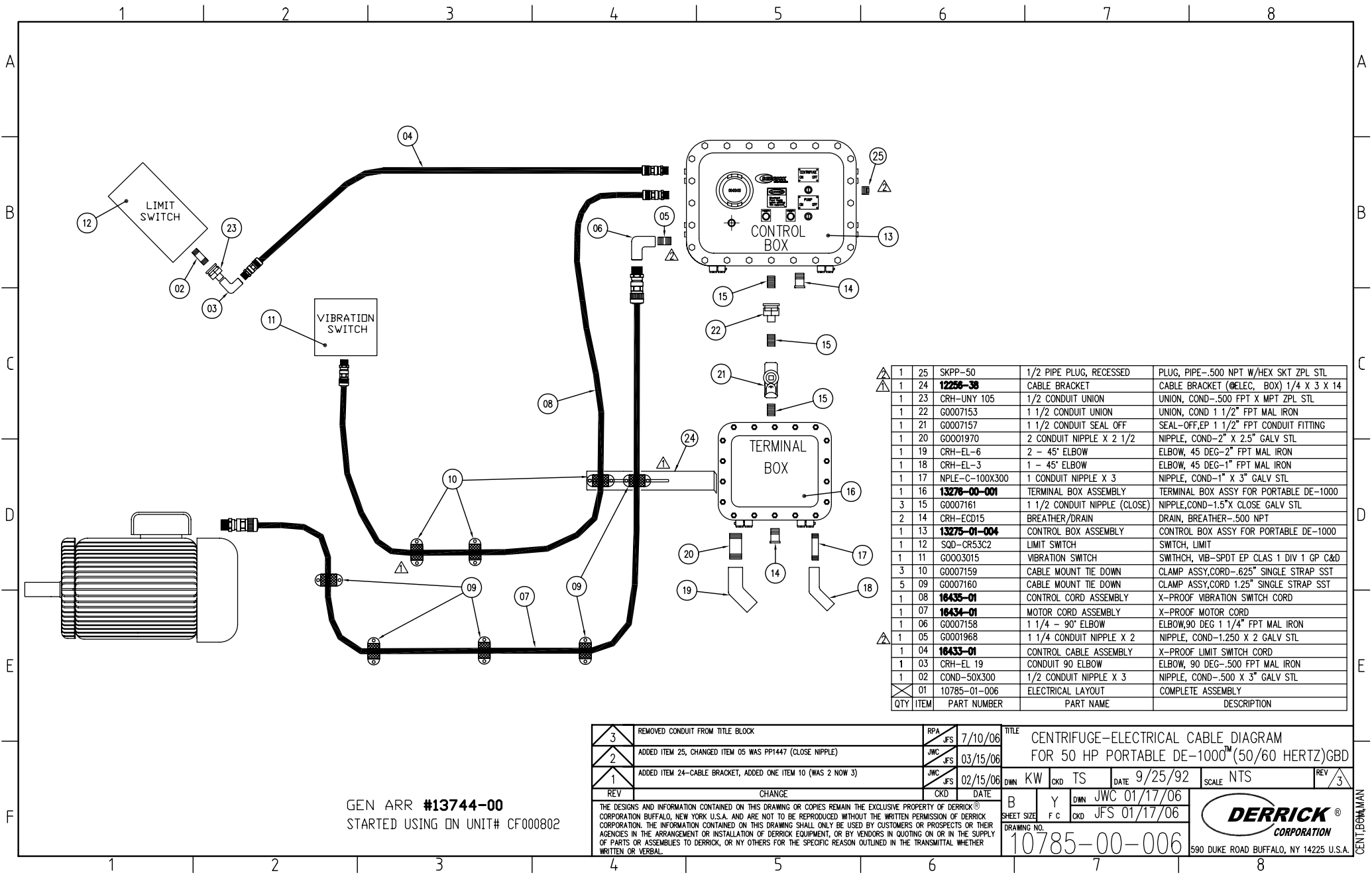
DERRICK CORPORATION

590 DUKE ROAD

BUFFALO, NEW YORK 14225 U.S.A.

TITLE LUBRICATION & MAINTENANCE SCHEDULE
DERRICK DE-1000™ CENTRIFUGE

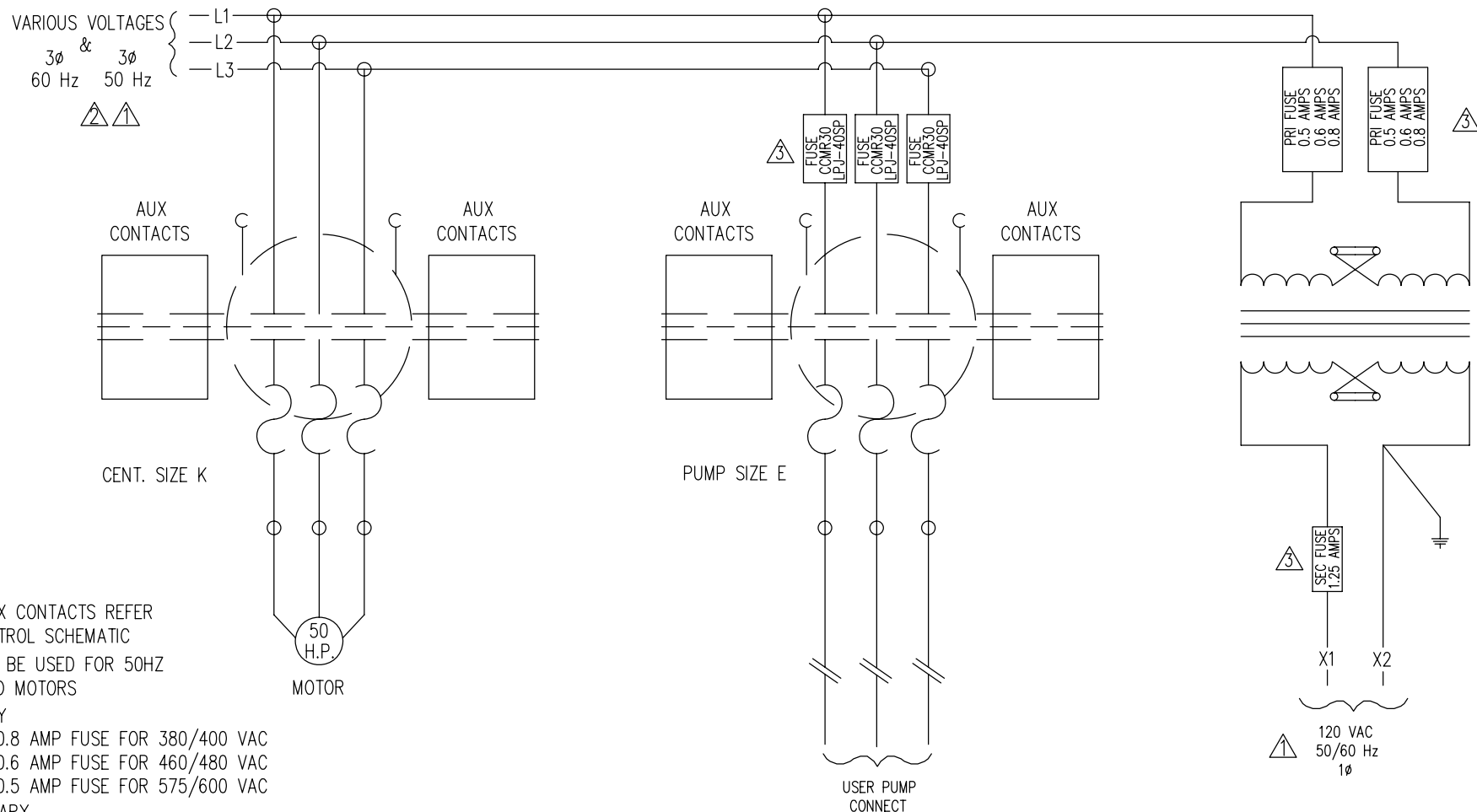
DWN	KW	CKD	TS	DATE	6-11-92	SCALE	NTS
00C	D B	Y	F C	DRAWING NO.	10647-00-002	FIG B.1	REV



1	25	SKPP-50	1/2 PIPE PLUG, RECESSED	PLUG, PIPE-.500 NPT W/HEX SKT ZPL STL
1	24	12256-38	CABLE BRACKET	CABLE BRACKET (ELEC. BOX) 1/4 X 3 X 14
1	23	CRH-UNY 105	1/2 CONDUIT UNION	UNION, COND-.500 FPT X MPT ZPL STL
1	22	G0007153	1 1/2 CONDUIT UNION	UNION, COND 1 1/2" FPT MAL IRON
1	21	G0007157	1 1/2 CONDUIT SEAL OFF	SEAL-OFF,EP 1 1/2" FPT CONDUIT FITTING
1	20	G0001970	2 CONDUIT NIPPLE X 2 1/2	NIPPLE, COND-2" X 2.5" GALV STL
1	19	CRH-EL-6	2 - 45° ELBOW	ELBOW, 45 DEG-2" FPT MAL IRON
1	18	CRH-EL-3	1 - 45° ELBOW	ELBOW, 45 DEG-1" FPT MAL IRON
1	17	NPLE-C-100X300	1 CONDUIT NIPPLE X 3	NIPPLE, COND-1" X 3" GALV STL
1	16	13276-00-001	TERMINAL BOX ASSEMBLY	TERMINAL BOX ASSY FOR PORTABLE DE-1000
3	15	G0007161	1 1/2 CONDUIT NIPPLE (CLOSE)	NIPPLE,COND-1.5"X CLOSE GALV STL
2	14	CRH-ECD15	BREATHER/DRAIN	DRAIN, BREATHER-.500 NPT
1	13	13275-01-004	CONTROL BOX ASSEMBLY	CONTROL BOX ASSY FOR PORTABLE DE-1000
1	12	SQD-CR53C2	LIMIT SWITCH	SWITCH, LIMIT
1	11	G0003015	VIBRATION SWITCH	SWTCH, VIB-SPDT EP CLAS 1 DIV 1 GP C&D
3	10	G0007159	CABLE MOUNT TIE DOWN	CLAMP ASSY,CORD-.625" SINGLE STRAP SST
5	09	G0007160	CABLE MOUNT TIE DOWN	CLAMP ASSY,CORD 1.25" SINGLE STRAP SST
1	08	16435-01	CONTROL CORD ASSEMBLY	X-PROOF VIBRATION SWITCH CORD
1	07	16434-01	MOTOR CORD ASSEMBLY	X-PROOF MOTOR CORD
1	06	G0007158	1 1/4 - 90° ELBOW	ELBOW,90 DEG 1 1/4" FPT MAL IRON
1	05	G0001968	1 1/4 CONDUIT NIPPLE X 2	NIPPLE, COND-1.250 X 2 GALV STL
1	04	16433-01	CONTROL CABLE ASSEMBLY	X-PROOF LIMIT SWITCH CORD
1	03	CRH-EL 19	CONDUIT 90 ELBOW	ELBOW, 90 DEG-.500 FPT MAL IRON
1	02	COND-50X300	1/2 CONDUIT NIPPLE X 3	NIPPLE, COND-.500 X 3" GALV STL
1	01	10785-01-006	ELECTRICAL LAYOUT	COMPLETE ASSEMBLY
QTY	ITEM	PART NUMBER	PART NAME	DESCRIPTION

GEN ARR #13744-00
STARTED USING ON UNIT# CF000802

3	REMOVED CONDUIT FROM TITLE BLOCK	RPA	JFS	7/10/06	TITLE CENTRIFUGE-ELECTRICAL CABLE DIAGRAM FOR 50 HP PORTABLE DE-1000™ (50/60 HERTZ)GBD						
2	ADDED ITEM 25, CHANGED ITEM 05 WAS PP1447 (CLOSE NIPPLE)	JWC	JFS	03/15/06	DWN	KW	OKD	TS	DATE 9/25/92	SCALE NTS	REV 3
1	ADDED ITEM 24-CABLE BRACKET, ADDED ONE ITEM 10 (WAS 2 NOW 3)	JWC	JFS	02/15/06							
REV	CHANGE	CKD	DATE								
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				B	Y	DWN	JWC	01/17/06	DERRICK CORPORATION 590 DUKE ROAD BUFFALO, NY 14225 U.S.A.		
				SHEET SIZE	F	C	OKD	JFS			
				DRAWING NO.				10785-00-006			



* NOTES:

1) FOR AUX CONTACTS REFER TO CONTROL SCHEMATIC

2) NOT TO BE USED FOR 50HZ DERATED MOTORS

3) PRIMARY
USE 0.8 AMP FUSE FOR 380/400 VAC
USE 0.6 AMP FUSE FOR 460/480 VAC
USE 0.5 AMP FUSE FOR 575/600 VAC

3 SECONDARY
ALWAYS USE 1.25 AMP FUSE

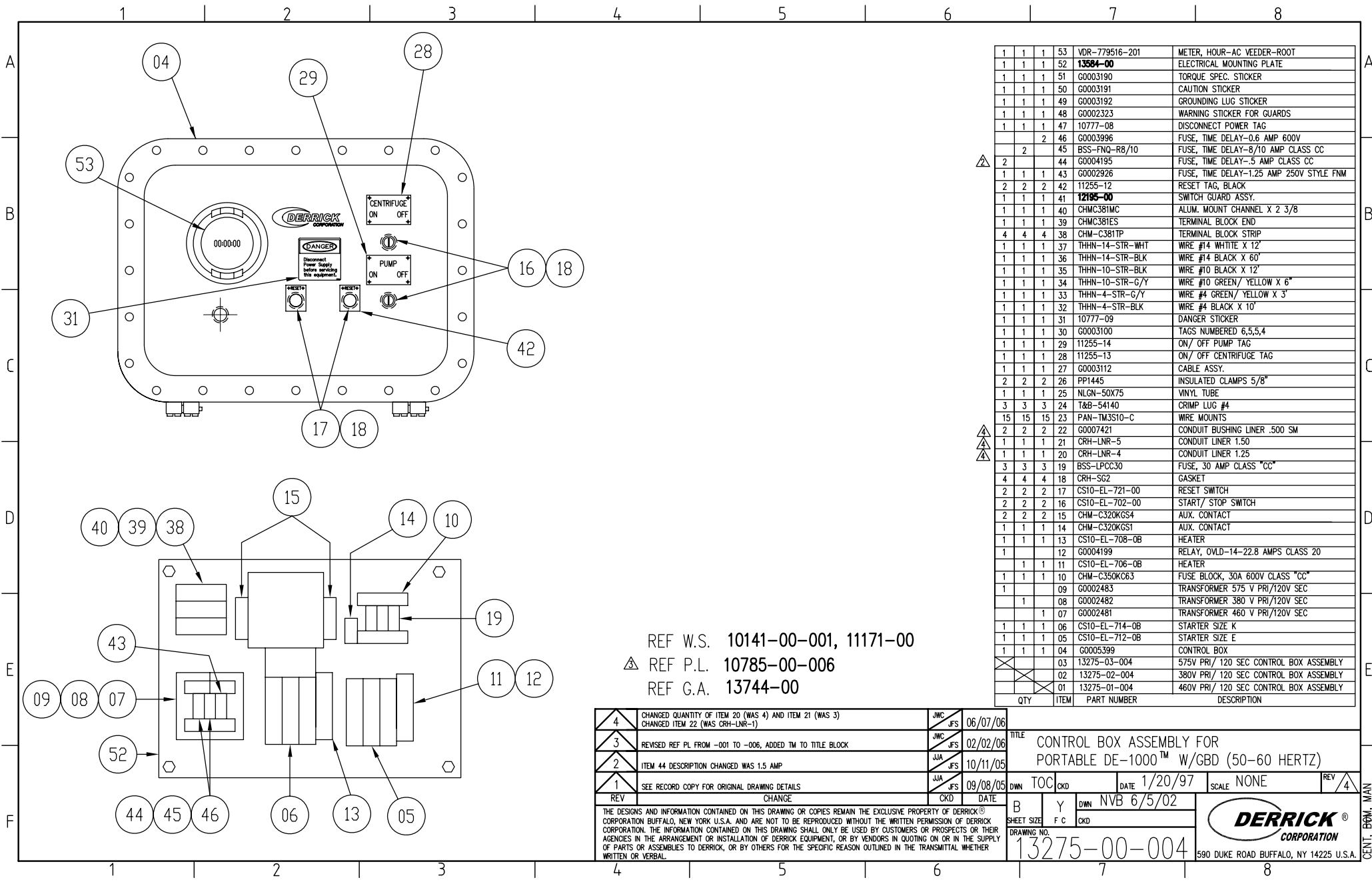
4) USE FUSE LPJ-40SP
WHEN SUPPLY VOLTAGE IS 380V, 50 Hz, 3Ø

REF. P.L. 13275-00-003

REF. P.L. 13275-00-004

3	ADDED NOTE #3 & #4, ADDED PARTS LIST REF #, ADDED NEW TRANSFORMER, FUSES WERE 1 AMP PRIMARY 1.2 AMPS SECONDARY	JJA	JFS	09/14/05	TITLE	CENTRIFUGE - HIGH VOLTAGE SCHEMATIC FOR PORTABLE DE-1000™ (50/60 HERTZ)				DATE	06/21/93	SCALE	NONE	REV	3
2	REMOVED VOLTAGES TO BE MORE GENERIC	JS	PR	09/26/00	DWN	KW	CKD	TS							
1	ADDED 50/60, 380/50Hz & NOTE 2	TOC		03/02/94											
REV	CHANGE	CKD	DATE		B1	Y	DWN								
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					DRAWING NO.	11171-00				DERRICK CORPORATION 590 DUKE ROAD BUFFALO, NY 14225 U.S.A.					

FIG 2.4



REF W.S. 10141-00-001, 11171-00
REF P.L. 10785-00-006
REF G.A. 13744-00

4	CHANGED QUANTITY OF ITEM 20 (WAS 4) AND ITEM 21 (WAS 3) CHANGED ITEM 22 (WAS CRH-LNR-1)	JWC	JFS	06/07/06
3	REVISED REF PL FROM -001 TO -006, ADDED TM TO TITLE BLOCK	JWC	JFS	02/02/06
2	ITEM 44 DESCRIPTION CHANGED WAS 1.5 AMP	JJA	JFS	10/11/05
1	SEE RECORD COPY FOR ORIGINAL DRAWING DETAILS	JJA	JFS	09/08/05

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1	1	1	53	VDR-779516-201	METER, HOUR-AC VEEDER-ROOT
1	1	1	52	13584-00	ELECTRICAL MOUNTING PLATE
1	1	1	51	G0003190	TORQUE SPEC. STICKER
1	1	1	50	G0003191	CAUTION STICKER
1	1	1	49	G0003192	GROUNDING LUG STICKER
1	1	1	48	G0002323	WARNING STICKER FOR GUARDS
1	1	1	47	10777-08	DISCONNECT POWER TAG
		2	46	G0003996	FUSE, TIME DELAY-0.6 AMP 600V
	2		45	BSS-FNQ-R8/10	FUSE, TIME DELAY-8/10 AMP CLASS CC
2			44	G0004195	FUSE, TIME DELAY-5 AMP CLASS CC
1	1	1	43	G0002926	FUSE, TIME DELAY-1.25 AMP 250V STYLE FNM
2	2	2	42	11255-12	RESET TAG, BLACK
1	1	1	41	12195-00	SWITCH GUARD ASSY.
1	1	1	40	CHMC381MC	ALUM. MOUNT CHANNEL X 2 3/8
1	1	1	39	CHMC381ES	TERMINAL BLOCK END
4	4	4	38	CHM-C381TP	TERMINAL BLOCK STRIP
1	1	1	37	THHN-14-STR-WHT	WIRE #14 WHITE X 12'
1	1	1	36	THHN-14-STR-BLK	WIRE #14 BLACK X 60'
1	1	1	35	THHN-10-STR-BLK	WIRE #10 BLACK X 12'
1	1	1	34	THHN-10-STR-G/Y	WIRE #10 GREEN/ YELLOW X 6"
1	1	1	33	THHN-4-STR-G/Y	WIRE #4 GREEN/ YELLOW X 3'
1	1	1	32	THHN-4-STR-BLK	WIRE #4 BLACK X 10'
1	1	1	31	10777-09	DANGER STICKER
1	1	1	30	G0003100	TAGS NUMBERED 6,5,5,4
1	1	1	29	11255-14	ON/ OFF PUMP TAG
1	1	1	28	11255-13	ON/ OFF CENTRIFUGE TAG
1	1	1	27	G0003112	CABLE ASSY.
2	2	2	26	PP1445	INSULATED CLAMPS 5/8"
1	1	1	25	NLGN-50X75	VINYL TUBE
3	3	3	24	T&B-54140	CRIMP LUG #4
15	15	15	23	PAN-TM3S10-C	WIRE MOUNTS
2	2	2	22	G0007421	CONDUIT BUSHING LINER .500 SM
1	1	1	21	CRH-LNR-5	CONDUIT LINER 1.50
1	1	1	20	CRH-LNR-4	CONDUIT LINER 1.25
3	3	3	19	BSS-LPCC30	FUSE, 30 AMP CLASS "CC"
4	4	4	18	CRH-SG2	GASKET
2	2	2	17	CS10-EL-721-00	RESET SWITCH
2	2	2	16	CS10-EL-702-00	START/ STOP SWITCH
2	2	2	15	CHM-C320KGS4	AUX. CONTACT
1	1	1	14	CHM-C320KGS1	AUX. CONTACT
1	1	1	13	CS10-EL-708-0B	HEATER
1			12	G0004199	RELAY, OVLD-14-22.8 AMPS CLASS 20
1	1	1	11	CS10-EL-706-0B	HEATER
1	1	1	10	CHM-C350KC63	FUSE BLOCK, 30A 600V CLASS "CC"
1			09	G0002483	TRANSFORMER 575 V PRI/120V SEC
	1		08	G0002482	TRANSFORMER 380 V PRI/120V SEC
		1	07	G0002481	TRANSFORMER 460 V PRI/120V SEC
1	1	1	06	CS10-EL-714-0B	STARTER SIZE K
1	1	1	05	CS10-EL-712-0B	STARTER SIZE E
1	1	1	04	G0005399	CONTROL BOX
			03	13275-03-004	575V PRI/ 120 SEC CONTROL BOX ASSEMBLY
			02	13275-02-004	380V PRI/ 120 SEC CONTROL BOX ASSEMBLY
			01	13275-01-004	460V PRI/ 120 SEC CONTROL BOX ASSEMBLY
QTY	ITEM	PART NUMBER		DESCRIPTION	

TITLE CONTROL BOX ASSEMBLY FOR PORTABLE DE-1000™ W/GBD (50-60 HERTZ)

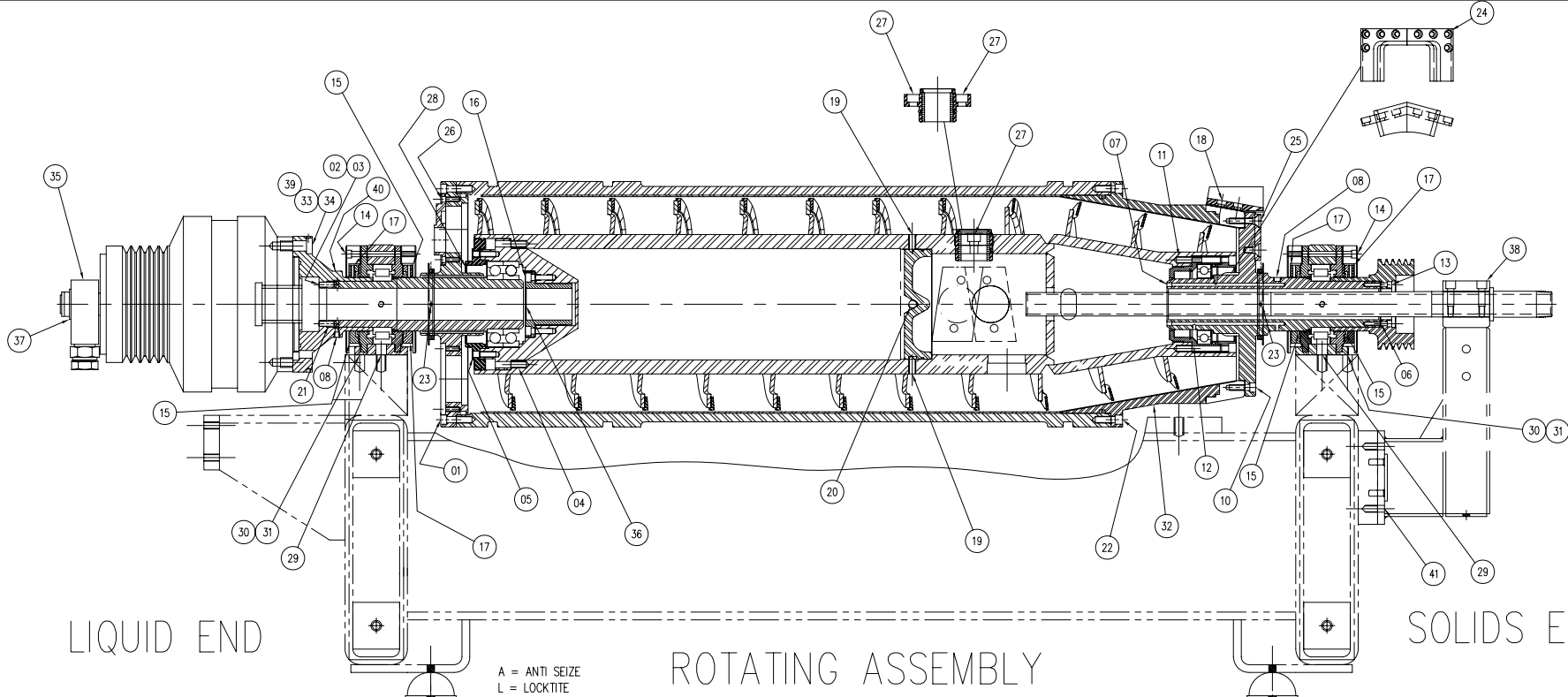
DWN TOC OKD DATE 1/20/97 SCALE NONE REV 4

B Y DWN NVB 6/5/02

SHEET SIZE F C OKD

DRAWING NO. 13275-00-004

DERRICK CORPORATION 590 DUKE ROAD BUFFALO, NY 14225 U.S.A.



A = ANTI SEIZE
L = LOCKTITE

ROTATING ASSEMBLY

QTY	ITEM	HARDWARE REQUIRED	PART NO# (PER PC)	TORQUE SETTING	LUBRICANT	REFERENCE PART
4	41	3/8-16 X 1 1/2 (HEX HEAD BOLT)	G0008180	N/A	A	FEED TUBE SUPPORT FLANGE
1	40	5/16-18 X 1 1/2 ALY (SET SCREW CUP PT)	G0004184	N/A	A	FLANGE TO KEY
6	39	M16 X 40 (HEX SOCKET ALY)	13635-38	N/A	A	ROTDIFF TO ROTODIFF FLANGE
4	38	3/8-16 X 2 1/2 (HEX HEAD BOLT)	G0008178	NO TORQUE	A	FEED TUBE MOUNTING BLOCK
1	37	30 x 1.5MM X 1.4W EXTERNAL SNAP RING	G0003966	N/A	N/A	ROTDIFF PORT BLOCK
2	36	3/8 X 1 PIN (STEEL)	PP1354	N/A	680L	SPLINE HUB
1	35	3MM SET (SET SCREW)	PP1134-714	N/A	A	PORT BLOCK
6	34	5/16-18 X 3/4 (HEX SOCKET)	SKCS-31-18X075	N/A	A	GEARBOX TO GEARBOX FLANGE
6	33	M16 X 35 (HEX SOCKET ALY/PLD)	13635-37	N/A	A	ROTDIFF TO ROTODIFF FLANGE
1	32	#8 PLUG SS	PKR-8-HP50N-SS	35 FT-LBS	A	BOWL EXTENSION
4	31	#7 PIN (3/8-24 X 2 1/2 STEEL)	13775-00	N/A	A	PILLOW BLOCK
4	30	#8 PIN (7/16-20 X 2 1/2 STEEL)	G0003955	N/A	A	PILLOW BLOCK
4	29	5/8-11 X 2 1/4 (HEX HEAD BOLT)	G0008202	197 FT-LBS	A	PILLOW BLOCK
2	28	3/8-16 X 1/2 SS (SET SCREW CUP POINT)	G0003950	N/A	A	SEAL HOUSING
8	27	1/2-13 X 1 SS (HEX SOCKET)	G0002156	53 FT-LBS	A	FEED NOZZLE
12	26	5/16-18 X 7/8 SS (HEX SOCKET)	G0001578	144 IN-LBS	A	EFFLUENT PORT
4	25	3/8-16 X 3/4 SS (FLAT HEAD HEX SOCKET)	FHSK-38-16X75-S	183 IN-LBS	A	SOLID HEAD PLOWS
32	24	5/16-18 X 3/4 SS (HEX SOCKET)	G0003059	144 IN-LBS	A	WEAR INSERTS
4	23	10-24 X 1/4 SS (SET SCREW CUP POINT)	G0003874	N/A	A	CASE FLINGER
12	22	3/8-16 X 1 SS (HEX SOCKET)	G0003064	252 IN-LBS	A	BOWL EXTENSION
9	21	5/16-18 X 1 (HEX SOCKET ALY)	SKCS-31-18X100	300 IN-LBS	262L	ROTDIFF/GEARBOX FLANGE
1	20	1/2-13 X 1 SS (SET SCREW FULL DOG)	G0003877	265 IN-LBS	A	FEED ACEEL BUMP
2	19	3/8-16 X 1 SS (SET SCREW CONE POINT)	G0003876	75 IN-LBS	A	FEED ACEEL BUMP
8	18	3/8-16 X 3/4 SS (HEX SOCKET)	G0003063	252 IN-LBS	A	CASE PLOWS
4	17	1/4-20 X 5/8 (HEX SOCKET SST)	G0008201	144 IN-LBS	A	PILLOW BLOCK FLINGER
8	16	3/8-16 X 1 SS (HEX SOCKET)	G0003064	252 IN-LBS	A	SPLINE HUB
16	15	3/8-16 X 1 SS (FLAT HEAD HEX SOCKET)	G0001868	183 IN-LBS	A	PILLOW BLOCK COVER
6	14	5/16-18 X 4 (HEX SOCKET SST)	G0008200	NO TORQUE	A	FLINGER COVER
8	13	1/4-20 X 1 SS (HEX SOCKET)	G0003056	83 IN-LBS	A	PULLEY SHEAVE
1	12	1/4 X 1 PIN (STEEL)	PP1361	N/A	680L	S/E BEARING HOUSING
6	11	5/16-18 X 3 SS (HEX SOCKET)	G0003062	144 IN-LBS	A	S/E SEAL HOUSING
8	10	3/8-16 X 1 SS (HEX SOCKET)	G0003064	252 IN-LBS	A	S/E BOWL HEAD
2	09	PLASTIC CAP	G0003467	N/A	N/A	S/E BOWL HEAD
4	08	1/8 NPT X 3/4 SS (GREASE FITTING)	G0003513	N/A	N/A	S/E BOWL HEAD
2	07	5/16-18 X 1/2 SS (SET SCREW CUP POINT)	G0005508	N/A	262L	S/E BOWL HEAD
4	06	1/4 X 1 1/4 PIN (STEEL)	G0001744	N/A	680L	S/E BOWL HEAD
4	05	3/8-16 X 1 SS (HEX SOCKET)	G0003064	252 IN-LBS	A	L/E SEAL HOUSING
8	04	3/8-16 X 1 1/2 SS (HEX SOCKET)	G0003066	252 IN-LBS	A	L/E BEARING HOUSING
1	03	5/16 X 5/16 X 3 KEY	G0003872	N/A	N/A	L/E BOWL HEAD
4	02	5/16 X 1 PIN (STEEL)	PP1362	N/A	680L	L/E BOWL HEAD
12	01	3/8-16 X 1 1/4 SS (HEX SOCKET)	G0003065	252 IN-LBS	A	L/E BOWL HEAD

NOTES:

- 1) MATERIAL: (HEX SOCKET BOLTS)
ALLOY STEEL - TENSILE STRENGTH 190,000 PSI MINIMUM (HEAT TREATED)
STAINLESS STEEL - TENSILE STRENGTH 80,000 PSI MINIMUM
- 2) QUANTITY LISTED IS PER ROTATING ASSEMBLY
IN THE RANGE OF CF000272 TO CF000678
- 3) * A) ITEMS 02 & 21 QTY'S ARE (4) FOUR FOR UNITS PRIOR TO SERIAL NUMBER CF000272
* B) ITEM 02 QTY IS (2) TWO & ITEM 21 QTY IS (6) SIX FOR UNITS WITH SERIAL NUMBERS
IN THE RANGE OF CF000272 TO CF000678
* C) ITEM 02 QTY IS (0) ZERO & ITEM 21 QTY IS (9) NINE FOR UNITS WITH SERIAL NUMBERS
ABOVE CF000679
- 4) D) ITEMS 35 & 37 ARE NOT REQUIRED AFTER UNIT CF000678
- 5) E) ITEM 33 TO BE USED WITH ROTODIFF ASSY 107/06V
ITEM 39 TO BE USED WITH ROTODIFF ASSY 1071

7	ADDED ITEM 41; ITEM 38 WAS SKCS-38-18X100; ITEM 29 WAS SKCS-63-11X200; ITEM 17 WAS G0003054; ITEM 14 WAS G0004087	DRG	07/09/07
6	UPDATED HARDWARE DESCRIPTIONS & PART NUMBERS IN PARTS LIST.	MOD	7/18/05
5	ITEM 07 WAS G0004184; ADDED ITEM 40; NOTE: SC QTY WAS 8 FOR ITEM 21; REMOVED VASELINE FROM LUBRICANT LIST; UPDATED VIEW	CSG	1/14/05
4	UPDATED HARDWARE DESCRIPTIONS & PART NUMBERS IN PARTS LIST.	MOD	4/1/04
3	ITEM 07 WAS G0003951; ITEM 21 QUANTITY WAS 8; ITEM 33 WAS M16 X 40; ITEM 39 ADDED TO BOWL; ADDED NOTE (E).	MOD	12/31/03
2	ITEM 33 WAS M16 X 35	SB	11/21/03
1	UPDATED TORQUE SETTINGS & NOTES; ITEM 29 TORQUE SETTING WAS 197 IN LBS IN ERROR; ITEM 38 WAS #8 PLUG SS	REV	3/22/02

REV	CHANGE	DATE	OWN	NVB	CSG	DATE	SCALE	1=5	REV
C	Y	OWN	DATE	3/21/01	SCALE	1=5	REV		

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CENTRIFUGE ROTATING ASSEMBLY
HARDWARE PARTS LIST

14894-00

DERRICK CORPORATION
590 DUKE ROAD, BUFFALO, NY 14225 U.S.A.

RECOMMENDED THERMAL UNIT SELECTION TABLE FOR DERRICK® SUPPLIED MANUAL STARTERS

DERRICK VIBRATING MACHINES

F, FX, K, KX, L, LX, T, TX MOTORS	575V.A.C.	60Hz	1.5HP	=	SQD-B3.30	or	FUR-H19
	460V.A.C.	60Hz	1.5HP	=	SQD-B4.15	or	FUR-H21
	230V.A.C.	60Hz	1.5HP	=	SQD-B10.2	or	FUR-H26
	215V.A.C.	60Hz	1.5HP	=	SQD-B10.2	or	FUR-H27
	440V.A.C.	50Hz	1.5HP	=	SQD-B3.70	or	FUR-H19
	380V.A.C.	50Hz	1.5HP	=	SQD-B4.15	or	FUR-H21
	220V.A.C.	50Hz	1.5HP	=	SQD-B8.20	or	FUR-H26
E, EX, M, MX, SG, SGX MOTORS	575V.A.C.	60Hz	2.5HP	=	SQD-B6.25	or	FUR-H24
	460V.A.C.	60Hz	2.5HP	=	SQD-B7.70	or	FUR-H26
	230V.A.C.	60Hz	2.5HP	=	SQD-B17.5	or	FUR-H32
	215V.A.C.	60Hz	2.5HP	=	SQD-B17.5	or	FUR-H32
	440V.A.C.	50Hz	2.5HP	=	SQD-B6.90	or	FUR-H24
	380V.A.C.	50Hz	2.5HP	=	SQD-B7.70	or	FUR-H26
	220V.A.C.	50Hz	2.5HP	=	SQD-B14.0	or	FUR-H31
R, RX MOTORS	575V.A.C.	60Hz	3.0HP	=	SQD-B6.90	or	FUR-H25
	460V.A.C.	60Hz	3.0HP	=	SQD-B9.10	or	FUR-H27
	230V.A.C.	60Hz	3.0HP	=	SQD-B19.5	or	FUR-H33
	215V.A.C.	60Hz	3.0HP	=	SQD-B19.5	or	FUR-H34
	440V.A.C.	50Hz	3.0HP	=	SQD-B7.70	or	FUR-H26
	380V.A.C.	50Hz	3.0HP	=	SQD-B9.10	or	FUR-H27
	220V.A.C.	50Hz	3.0HP	=	SQD-B17.5	or	FUR-H32
A, C, N MOTORS	575V.A.C.	60Hz	5.0HP	=	SQD-B11.5	or	FUR-H29
	460V.A.C.	60Hz	5.0HP	=	SQD-B15.5	or	FUR-H32
	230V.A.C.	60Hz	5.0HP	=	SQD-B36.0	or	FUR-H40
	215V.A.C.	60Hz	5.0HP	=	SQD-B36.0	or	FUR-H40
	440V.A.C.	50Hz	5.0HP	=	SQD-B12.8	or	FUR-H30
	380V.A.C.	50Hz	5.0HP	=	SQD-B15.5	or	FUR-H32
	220V.A.C.	50Hz	5.0HP	=	SQD-B32.0	or	FUR-H37

DERRICK DEGASSER

575V.A.C.	60Hz	5.0HP	=	SQD-B8.20	or	FUR-H28
460V.A.C.	60Hz	5.0HP	=	SQD-B10.2	or	FUR-H30
230V.A.C.	60Hz	5.0HP	=	SQD-B19.5	or	FUR-H38
415V.A.C.	50Hz	5.0HP	=	SQD-B11.5	or	FUR-H31
380V.A.C.	50Hz	5.0HP	=	SQD-B19.5	or	FUR-H32

DERRICK PRIMER

575V.A.C.	60Hz	1.5HP	=	SQD-B3.30
460V.A.C.	60Hz	1.5HP	=	SQD-B3.70
230V.A.C.	60Hz	1.5HP	=	SQD-B8.20
380V.A.C.	50Hz	1.5HP	=	SQD-B3.70

NOTE: IF MOTOR VOLTAGE OR HORSE POWER IS NOT LISTED, CONTACT ENGINEERING DEPARTMENT.

**** FOR MAGNETIC STARTER OVERLOAD INFO REFER TO THE ELECTRICAL PARTS LIST THAT IS FOUND ON THE EQUIPMENTS GENERAL ARRANGEMENT DRAWING.

Derrick®, Flo-Line®, FLC 2000™, Flo-Line Scalper™, Pyramid®, Sandwich Screens®, DE-1000™, Hi-G™, Vacu-Flo™, GBG™, PMD™, PWPT™, SWGT™, DC™, DFT™, DX™, and GST™, are trademarks of Derrick Corporation.



SUPPLIER DATA

DE-1000 CENTRIFUGE - GEARBOX DRIVE

GENERAL

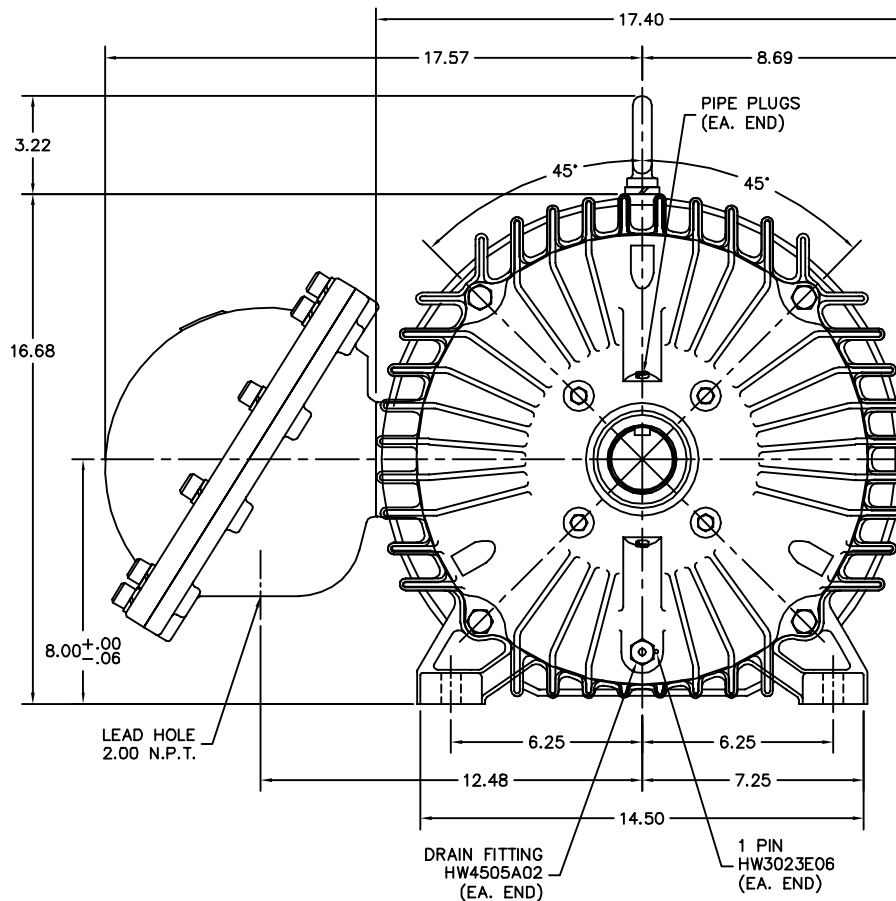
This section contains manufacturers' manuals, bulletins, instructions, and other technical data for components installed on the centrifuge. Refer to Section 11 - Reference Drawings for the Derrick assembly drawings, parts lists, and electrical diagrams.

ELECTRICAL COMPONENTS		
COMPONENT	DESCRIPTION	DOCUMENT
Baldor Motor Model M7064T-I	Layout Drawing	12LYS077
	Connection Diagram	CD1080
	Performance Data & Specifications	No Number
Shock/Vibration Switch Model VS2EX	Installation Instructions	VS-7037N

MECHANICAL COMPONENTS		
COMPONENT	DESCRIPTION	DOCUMENT
Overload Release Clutch	Installation & Maintenance Instructions	ORC Series S

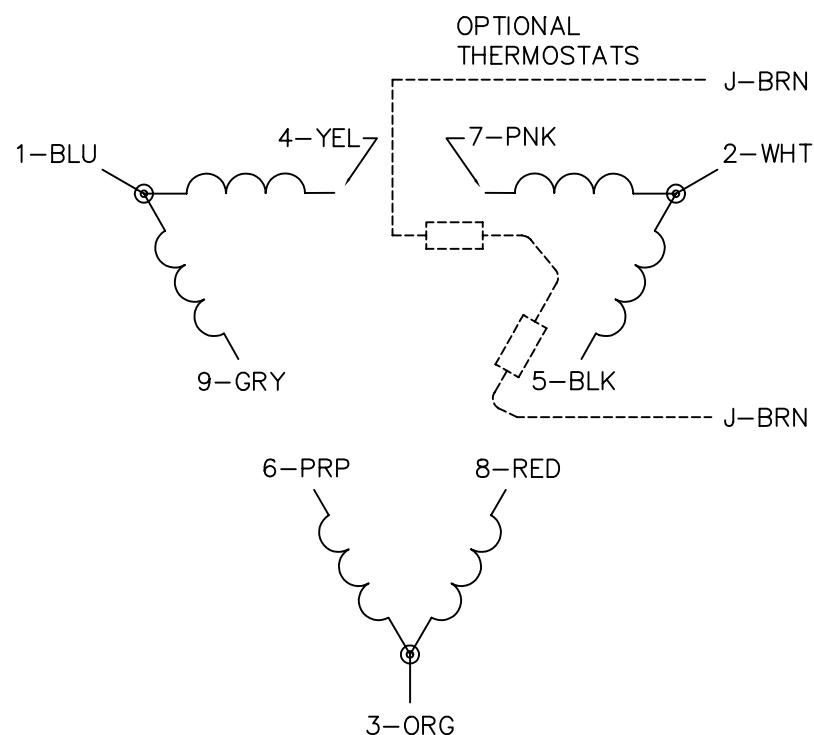
The content of this document is subject to change at any time. Information provided does not cover all details or variations possible with DERRICK equipment, nor does it cover every contingency that may be met in conjunction with installation, operation, maintenance, or troubleshooting of the equipment. Should additional information be required, or should situations arise that are not covered by this manual, bring the matter to the attention of your local DERRICK representative or the Service Department at DERRICK Corporation in Buffalo, New York.

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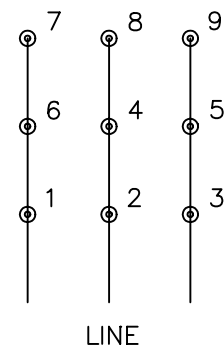


REV. DESC: CHG'D TO NEW DRAIN DESIGN			
REV. LTR: B	BY: RAR	REVISED: 09:17:38 01/18/2002	TDR: 260522
FILE: AAA00072693			REF: 12LYS077
MTL: -			

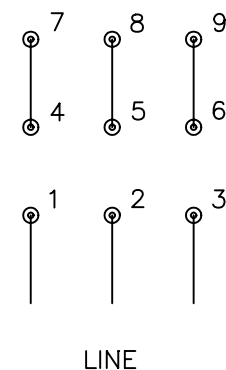
12LYS077	
----------	--



LOW VOLTAGE
(2D)



HIGH VOLTAGE
(1D)



NOTES:

1. INTERCHANGE ANY TWO LINE LEADS TO REVERSE ROTATION.
2. OPTIONAL THERMOSTATS ARE PROVIDED WHEN SPECIFIED.
3. ACTUAL NUMBER OF INTERNAL PARALLEL CIRCUITS MAY BE A MULTIPLE OF THOSE SHOWN ABOVE.
4. LEAD COLORS ARE OPTIONAL. LEADS MUST ALWAYS BE NUMBERED AS SHOWN.

REV. DESC: REVISE TO SHOW OPTIONAL COLORS

REV. LTR: C BY: JLP REVISED: 01/21/99 2:28 TDR: 0171435

081000

FILE: AAA00005148

MDL: -

MTL: -

BALDOR ELECTRIC Co.

3PH, DV, 9 LEADS, DELTA CONNECTION

Performance Data: M7064T-I

Nameplate Data		General Characteristics at 460 V, 60 Hz						
Rated Output	50 HP	Full Load Torque				149 LB-FT		
Volts	230/460	Start Configuration				DOL		
Full Load Amps	120/60	Break Down Torque				440 LB-FT		
Speed	1775	Pull-Up Torque				191 LB-FT		
Hertz	60	Locked-Rotor Torque				240 LB-FT		
Phase	3	Starting Current				398 Amps		
NEMA Design Code	A	No-Load Current				20 Amps		
LR KVA Code	H	Line-line Resistance @ 25° C				0.119 Ohms		
NEMA Nom. Eff.	93	Temperature Rise, C @ FL (in deg)				62		
Power Factor	86	Temp. Rise @ S.F. Load (in deg)				0		
Service Factor	1							
Rating - Duty	40C AMB-CONT							
Load Characteristics at 460 V, 60 Hz								
% of Rated Load		25	50	75	100	125	150	S.F.
Power Factor		56	75	83	85	86	86	0
Efficiency		86.2	91.4	92.9	93.2	93.1	92.5	0
Speed (rpm)		1794	1789	1783	1777	1770	1762	0
Line Amperes		25.1	34.6	46.2	59.1	73	88.3	0

Specifications: M7064T-I

Catalog Number:	M7064T-I
Specification Number:	12S077X139H1
Horsepower:	50//40
Voltage:	230/460//190/380
Hertz:	60//50
Phase:	3
Full Load Amps:	120/60//114/57
Usable at 208 Volts:	126
RPM:	1775//1475
Frame Size:	326T
Service Factor:	1.15
Rating:	40C AMB-CONT
Locked Rotor Code:	H
NEMA Design Code:	A
Insulation Class:	F
Full Load Efficiency:	93
Power Factor:	86
Enclosure:	N/A
Baldor Type:	1262M
DE Bearing:	N/A
ODE Bearing:	N/A
Electrical Specification Number:	12WGX139
Mechanical Specification Number:	12S077
Base:	RG
Mounting:	F1

Shock/Vibration Control Switches Installation Instructions

Models: VS2, VS2C, VS2EX, VS2EXR, VS2EXRB and VS94



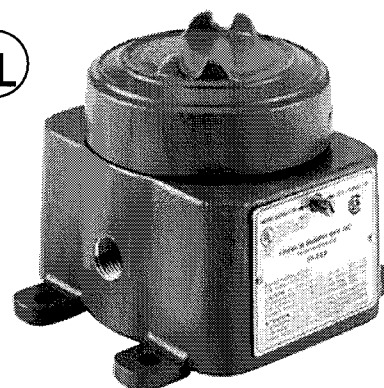
Please read the following instructions before installing. A visual inspection of this product for damage during shipping is recommended before mounting. It is your responsibility to have a qualified person install the unit, and make sure installation conforms with NEC and local codes.

GENERAL INFORMATION

WARNING

BEFORE BEGINNING INSTALLATION OF THIS MURPHY PRODUCT

- ✓ Disconnect all electrical power to the machine.
- ✓ Make sure the machine cannot operate during installation.
- ✓ Follow all safety warnings of the machine manufacturer.
- ✓ Read and follow all installation instructions.



Model VS2EX

Description

The Murphy shock and vibration switches are available in a variety of models for applications on machinery or equipment where excessive vibration or shock can damage the equipment or otherwise poses a threat to safe operation. A set of contacts is held in a latched position through a mechanical latch and magnet mechanism. As the level of vibration or shock increases an inertia mass exerts force against the latch arm and forces it away from the magnetic latch causing the latch arm to operate the contacts. Sensitivity is obtained by adjusting the amount of the air gap between the magnet and the latch arm plate.

Applications include all types of rotating or reciprocating machinery such as cooling fans, engines, pumps, compressors, pump jacks, etc.

Models

VS2: Base mount; non hazardous locations.

VS2C: C-clamp mount; non hazardous locations.

VS2EX: Explosion-proof; Class I, Div. 1, Groups C and D.

VS2EXR: Explosion-proof with remote reset.

VS2EXRB: Explosion-proof; Class I, Div. 1, Group B; with remote reset.

VS94: Base mount; non hazardous locations, NEMA 4X/IP66.

Remote Reset Feature (VS2EXR, VS2EXRB and VS94 only)

Includes built-in electric solenoid which allows reset of tripped unit from a remote location. Standard on VS2EXR and VS2EXRB. Optional on VS94 (options listed below).

-R15: Remote reset for 115 VAC

-R24: Remote reset for 24 VDC

Time Delay Option (VS94 only)

Overrides trip operation on start-up. For VS94 series models, the delay time is field-adjustable from 5 seconds up to 100 seconds with a 20-turn potentiometer (5 seconds per turn approximately). Options listed below:

-T15: Time delay for 115 VAC

-T24: Time delay for 24 VDC

Space Heater Options (VS94 only)

This optional space heater board prevents moisture from condensing inside the VS94 Series case. Options listed below:

-H15: Space heater for 115 VAC

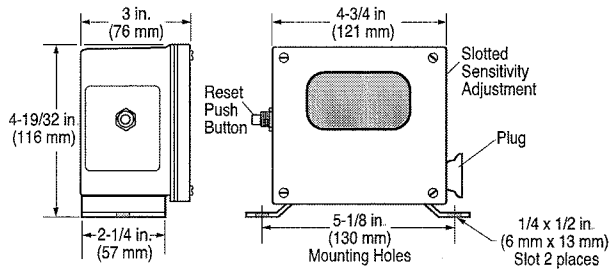
-H24: Space heater for 24 VDC

Warranty

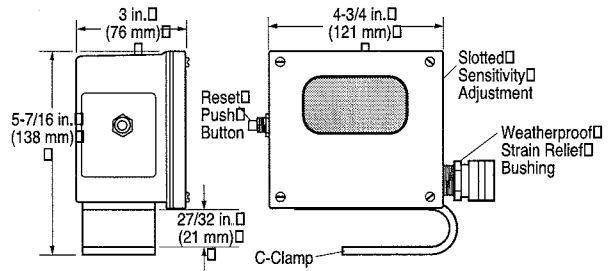
A limited warranty on materials and workmanship is given with this FW Murphy product. A copy of the warranty may be viewed or printed by going to www.fwmurphy.com/support/warranty.htm

DIMENSIONS

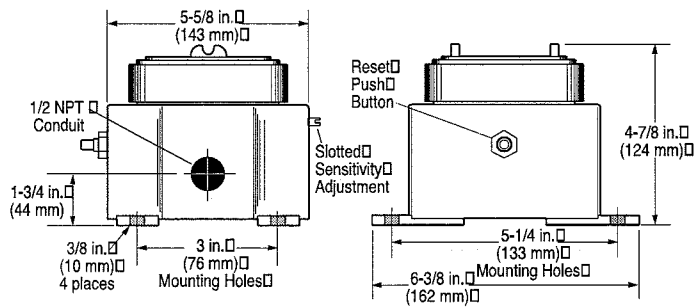
VS2



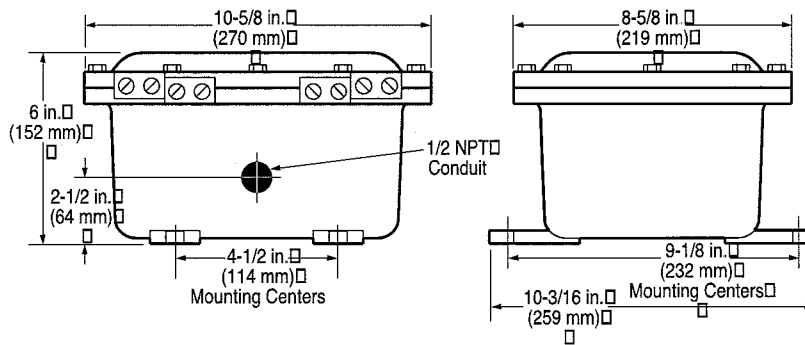
VS2C



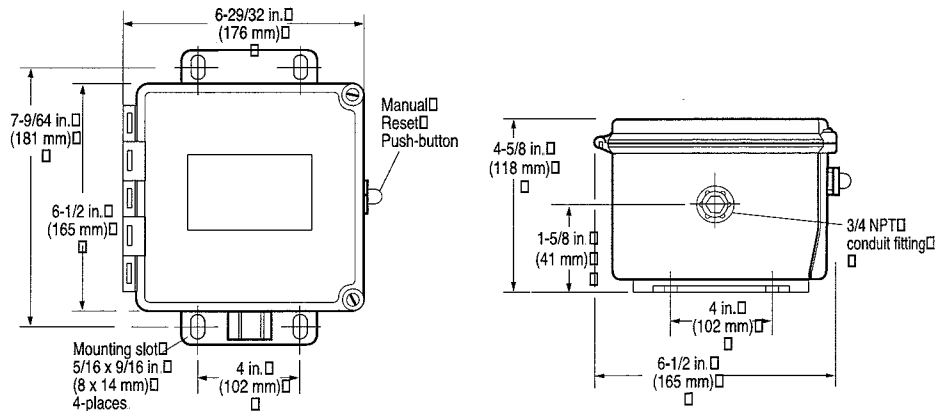
VS2EX and VS2EXR



VS2EXRB



VS94



SPECIFICATIONS

VS2 and VS2C

- **Case:** Weatherproof (equal to NEMA 3R) suitable for non-hazardous areas.
VS2: *Base mount*
VS2C: *C-clamp mount. Includes 45 feet (13.7 meters), 2-conductor 16 AWG, 30 strands/0.25 mm strand dia (1.5 mm²) cable, and five cable hold down clamps.*
- **Contacts:** SPDT double make leaf contacts, 5A @ 480 VAC.
- **Range adjustment:** 0 - 7 G's; 0 - 100 Hz /0.100 in. displacement.

VS2EX

- **Case:** Explosion-proof and weatherproof aluminum alloy housing; meets NEMA 7/IP50 specifications; Class I, Division 1, Groups C & D; UL and CSA listed*
VS2EX: *base mount.*
- **Snap-switches:** 2-SPDT snap-switches; 5A @ 480 VAC;*
2A resistive, 1A inductive, up to 30 VDC.
- **Range adjustment:** 0 - 7 G's; 0 - 100 Hz /0.100 in. displacement.
- **Normal Operating Temperature:** -40 to 140°F (-40 to 60°C).

VS2EXR

- **Case:** Same as VS2EX.
- **Snap-switch:** 1-SPDT snap-switch and reset coil; 5A @ 480 VAC;* 2A resistive, 1A inductive, up to 30 VDC.
- **Remote Reset (optional):**

<i>Option</i>	<i>Operating Current</i>
-R15:	350 mA @ 115 VAC
-R24:	350 mA @ 24 VDC
- **Range adjustment:** 0 - 7 G's; 0 - 100 Hz /0.100 in. displacement
- **Normal Operating Temperature:** -40 to 140°F (-40 to 60°C).

VS2EXRB

- **Case:** Explosion-proof aluminum alloy housing; rated Class I, Division 1, Group B hazardous areas.
- **Snap-switch:** 1-SPDT snap-switch with reset coil (option available for

additional SPDT switch); 5A @ 480 VAC; 2A resistive, 1A inductive, up to 30 VDC.

• Remote Reset:

Option Operating Current

-R15: 350 mA @ 115 VAC

-R24: 350 mA @ 24 VDC

- **Range adjustment:** 0 - 7 G's; 0 - 100 Hz /0.100 in. displacement.

VS94

- **Case:** Polyester fiberglass reinforced; NEMA type 4 and 4X; IP66; CSA types 4 and 12.
- **Conduit Fitting:** 3/4 NPT conduit fitting connection.
- **Normal Operating Ambient Temperature:**
0 to 140°F (-18 to 60°C).
- **Snap-switches:** 2-SPDT snap acting switches; 5A @ 480 VAC; 2A resistive, 1A inductive, up to 30 VDC.
- **Range adjustment:** 0 - 7 G's; 0 - 100 Hz /0.100 in. displacement.
- **Heater (optional):**

<i>Option</i>	<i>Operating Current</i>
H15	0.23 A @ 115 VAC
H24	1.2 A @ 24 VDC
- **Remote Reset (optional):**

<i>Option</i>	<i>Operating Current</i>
R15	1.7 A @ 115 VAC
R24	3.6 A @ 24 VDC
- **Time Delay (optional):**

<i>Option</i>	<i>Operating Current</i>	<i>Standby Current</i>
T15	3.60 A @ 115 VAC	0.1 A @ 115 VAC
T24	1.15 A @ 24 VDC	0.1 A @ 24 VDC
- **Time Delay/Remote Reset:** Adjustable 20-turn potentiometer from 5 seconds to 100 seconds (5 seconds per turn approximately).

*CSA and UL listed with 480 VAC rating

INSTALLATION



WARNING: STOP THE MACHINE AND DISCONNECT ALL ELECTRICAL POWER BEFORE BEGINNING INSTALLATION.

The VS2 and VS94 series shock switches are sensitive to shock and vibration in all three planes of motion - up/down, front/back and side/side. Front/back is the most sensitive (The reset pushbutton is located on the "front" of the unit). For maximum sensitivity mount the unit so that the front faces into the direction of rotation of the machine. (See Dimensions on page 2 for sensitivity adjustment location).

The VS2 and VS94 Series must be firmly attached/mounted to the machine so that all mounting surfaces are in rigid contact with the mounting surface of the machine. For best results, mount the instrument in-line with the direction of rotating shafts and/or near bearings. In other words, the reset push button should be mounted pointing into the direction of shaft rotation (see page 5). It may be necessary to provide a mounting plate or bracket to attach the VS2 and VS94 Series to the machine. The mounting bracket should be thick enough to prevent induced acceleration/vibration upon the VS2 or VS94 Series. Typically 1/2 in. (13mm) thick plate is sufficient. See illustrations on page 5 for typical mounting locations.



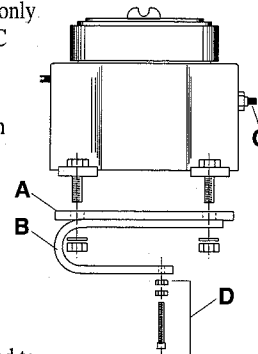
CAUTION: A dust boot is provided on the reset pushbutton for all series to prevent moisture or dust intrusion. The sensitivity adjustment for model VS2EX is not sealed; therefore, mounting

orientation should be on a horizontal plane or with the sensitivity adjustment pointing down. Sensitivity adjustment for model VS2 is covered by a plug. The plug must be in place and tight to prevent moisture or dust intrusion.

C-Clamp Installation (VS2C model only)

A C-Clamp is supplied with the VS2C model only. The C-Clamp is shipped installed on the VS2C but must be installed on the VS2EX and VS2EXR switches.

1. The C-Clamp (B) will already be installed on a 1/4 in. (6 mm) thick steel mounting plate (A). Bolt the VS2 switch to the mounting plate as illustrated — with four 5/16 in. bolts, nuts, and washers.
2. The mounting location should provide convenient access to the TATTLETALE® push button (C).
3. The hardened set screw and nuts (D) are used to tighten the switch to an I-Beam or cross member such as a Sampson post of an oilwell pumpjack.



Continued on next page

All Models



WARNING: STOP THE MACHINE AND DISCONNECT ALL ELECTRICAL POWER BEFORE BEGINNING INSTALLATION.

1. Firmly secure the unit to the equipment using the base foot mount or C-Clamp if applicable. See *C-Clamp Installation* page 3.
For oilwell pumpjacks attach the VS2 and VS94 Series to the Sampson post or walking beam. See *Typical Mounting Locations* page 5.
2. Make the necessary electrical connections to the vibration switch. See *Internal Switches*, page 6 for electrical terminal locations and page 7 for typical wiring diagrams. **DO NOT EXCEED VOLTAGE OR CURRENT RATINGS OF THE CONTACTS.** Follow appropriate electrical codes/methods when making electrical connections. Be sure that the run of electrical cable is secured to the machine and is well insulated from electrical shorting. Use of conduit is recommended.

NOTE: If the electrical cable crosses a pivot point such as at the pivot of the walking beam, be sure to allow enough slack in the cable so that no stress is placed on the cable when the beam moves.

If conduit is not used for the entire length of wiring, conduit should be used from the electrical supply box to a height above ground level that prevents damage to the exposed cable from the elements, rodents, etc. or as otherwise required by applicable electrical codes. If conduit is not attached directly to the VS2 and VS94 Series switch, use a strain relief bushing and a weatherproof cap on the exposed end of the conduit. A "drip loop" should be provided in the cable to prevent moisture from draining down the cable into the conduit should the weathercap fail.

Sensitivity Adjustment



WARNING: REMOVE ALL POWER BEFORE OPENING THE ENCLOSURE. IT IS YOUR RESPONSIBILITY TO HAVE A QUALIFIED PERSON PERFORM ADJUSTMENTS, AND MAKE SURE IT CONFORMS WITH NEC AND LOCAL CODES. DO NOT ADJUST SENSITIVITY WHILE THE MACHINE IS RUNNING. STAND CLEAR OF THE MACHINE AT ALL TIMES WHEN IT IS OPERATING.

All models of the VS2 and VS94 Series cover a wide range of sensitivity. Each model is adjusted to the specific piece of machinery on which it is installed. After the switch has been installed in a satisfactory location (see page 5) the sensitivity adjustment will be increased or decreased so that the switch does not trip during start-up or under normal operating conditions. This is typically done as follows:

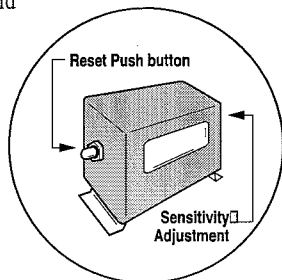
1. REPLACE ALL COVERS, LIDS, AND ELECTRICAL ENCLOSURES.

2. Press the reset push button to engage the magnetic latch. To be sure the magnetic latch has engaged, observe latch through the window on the VS2 and VS2C (see DETAIL "A"). On the VS2EX, VS94 series the reset button will remain depressed meaning the magnetic latch has engaged.

3. Start the machine.

4. If the instrument trips on start-up,

DETAIL "A"



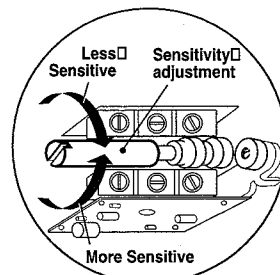
allow the machine to stop. Turn the sensitivity adjustment 1/4 turn clockwise, (adjustment for VS94 and VS2EXRB models is located within the box, see DETAIL "B").



WARNING: MAKE THE AREA NON-HAZARDOUS BEFORE OPENING THE EXPLOSION-PROOF (-EX) ENCLOSURES.

Depress the reset button and restart the machine. Repeat this process until the unit does not trip on start-up.

DETAIL "B"



5. If the instrument does NOT trip on start-up, stop the machine. Turn the sensitivity adjustment 1/4 turn counter-clockwise. Repeat the start-up/stop process until the instrument trips on start-up. Turn the sensitivity adjustment 1/4 turn clockwise (less sensitive). Restart the machine to verify that the instrument will not trip on start-up.

6. Verify that the unit will trip when abnormal shock/vibration exists.

VS94 Time Delay Adjustment

1. Apply power to the time delay circuit. (see page 7 for time delay circuit). The time delay function will be initiated.
2. Time the length of the delay with a watch. Let time delay expire. After it expires, the override circuit will de-energize the solenoid, allowing the latch arm to trip. A clicking noise is heard.



WARNING: REMOVE ALL POWER BEFORE OPENING ACCESS DOOR. IT IS YOUR RESPONSIBILITY TO HAVE A QUALIFIED PERSON ADJUST THE UNIT, AND MAKE SURE IT CONFORMS WITH NEC AND LOCAL CODES.

3. TURN THE POWER OFF TO RESET THE TIME DELAY CIRCUIT.

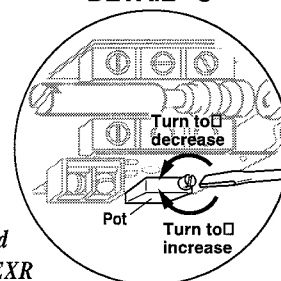
NOTE: Allow 30 seconds bleed-time between turning the power "OFF" and "ON".

4. Locate the time adjustment pot (DETAIL "C").
The time is factory-set at the lowest setting (5 seconds approximately). To increase time, rotate the 20-turn pot clockwise as needed (5 seconds per turn approximately).

5. Repeat the above steps as necessary to obtain desired time delay.

NOTE: An external time delay can be used with the remote reset feature of the VS2EXR series to provide a remote reset and override of the trip operation on start-up. Time delay must automatically disconnect after equipment start-up.

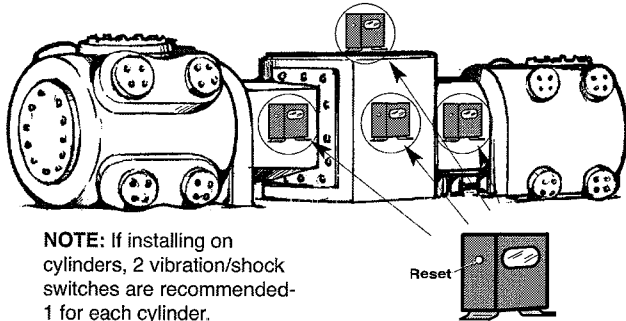
DETAIL "C"



TYPICAL MOUNTING LOCATIONS

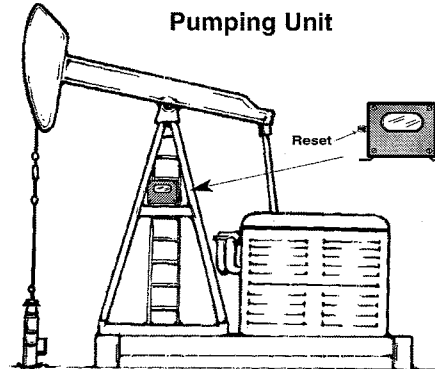
NOTE: These are typical mounting locations for best operation. Other mountings are possible. See *Installation* section on page 3.

2-Throw Balance-Opposed Compressor

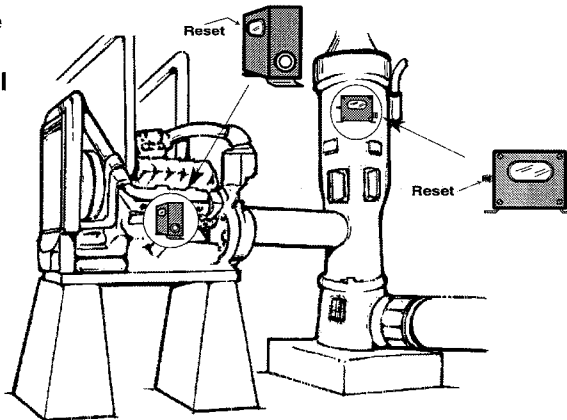


NOTE: If installing on cylinders, 2 vibration/shock switches are recommended- 1 for each cylinder.

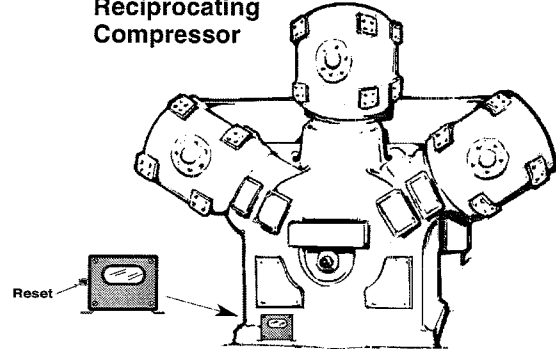
Pumping Unit



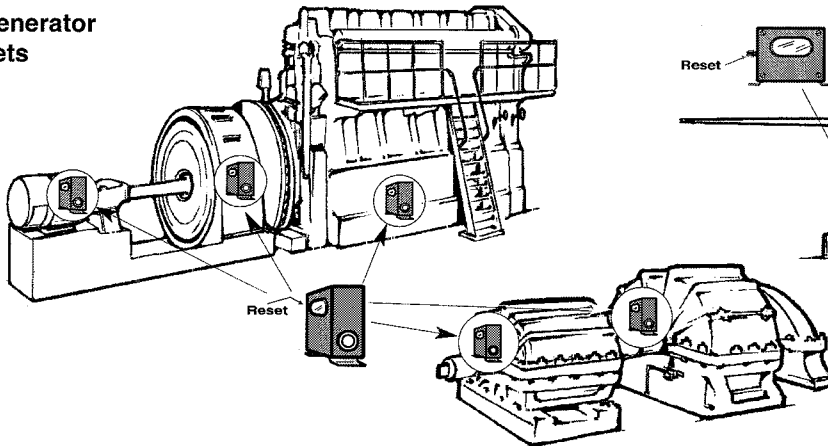
Engine and Vertical Shaft Pump



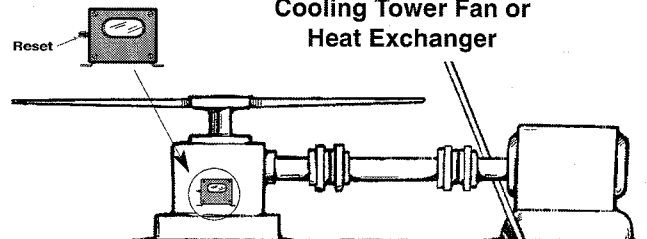
"Y" Type Reciprocating Compressor



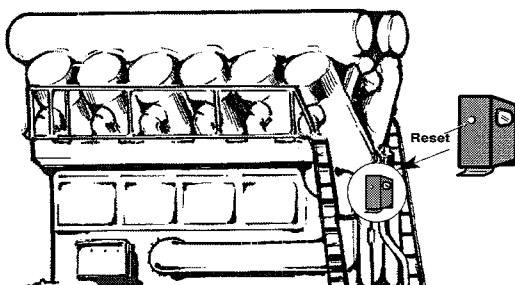
Generator Sets



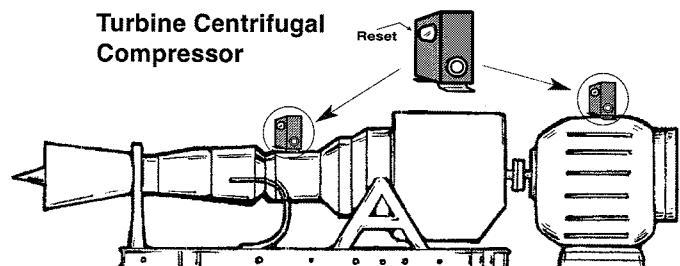
Cooling Tower Fan or Heat Exchanger



Engine Compressor

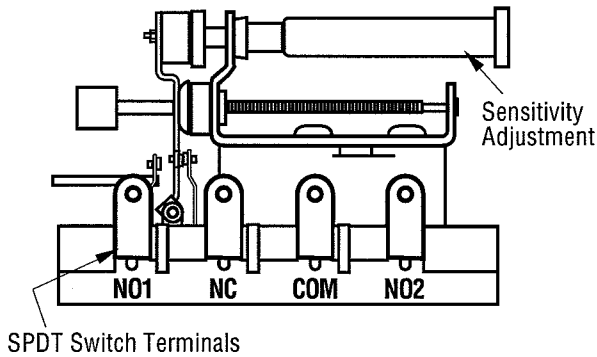


Turbine Centrifugal Compressor

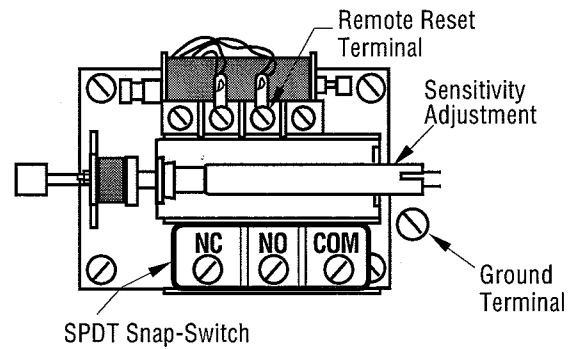


INTERNAL SWITCHES

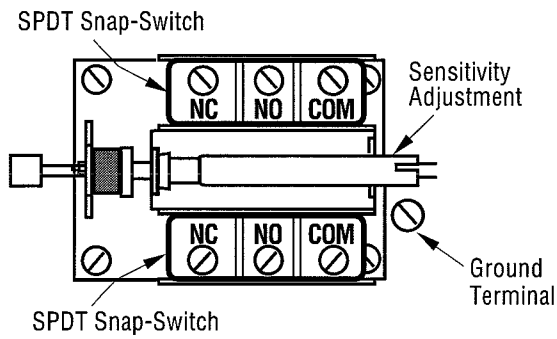
VS2 and VS2C



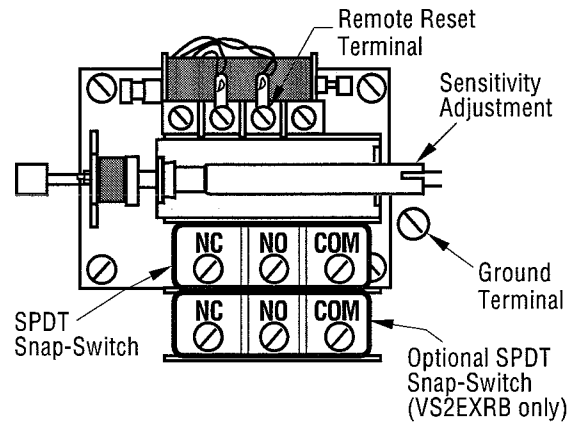
VS2EXR



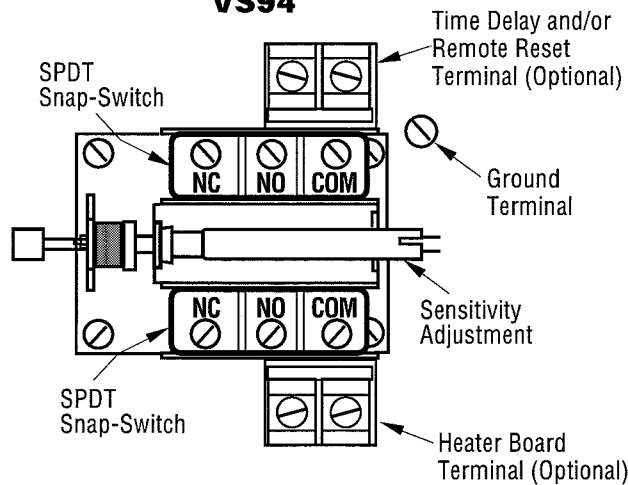
VS2EX



VS2EXB and VS2EXRB



VS94

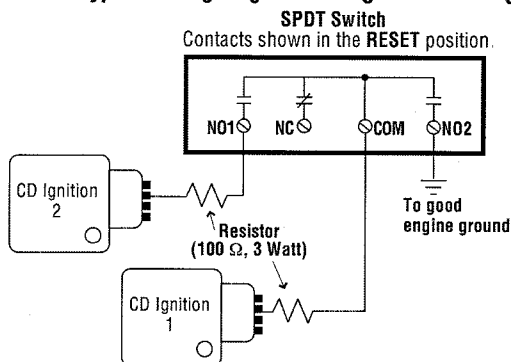


ELECTRICAL

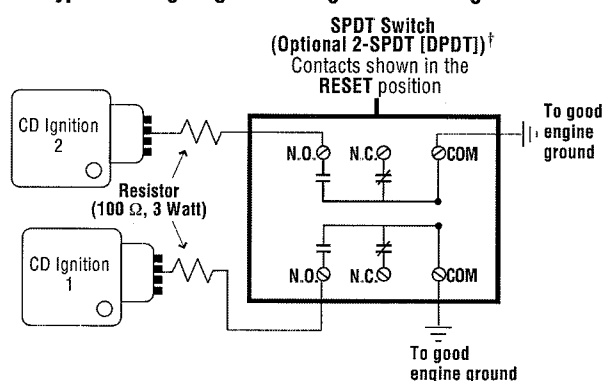


WARNING: REMOVE POWER BEFORE OPENING THE UNIT (ACCESS DOOR). STOP THE MACHINE AND DISCONNECT ALL ELECTRICAL POWER BEFORE BEGINNING THE WIRING OPERATION. IT IS YOUR RESPONSIBILITY TO HAVE A QUALIFIED PERSON INSTALL AND WIRE THE UNIT, AND MAKE SURE IT CONFORMS WITH NEC AND APPLICABLE CODES.

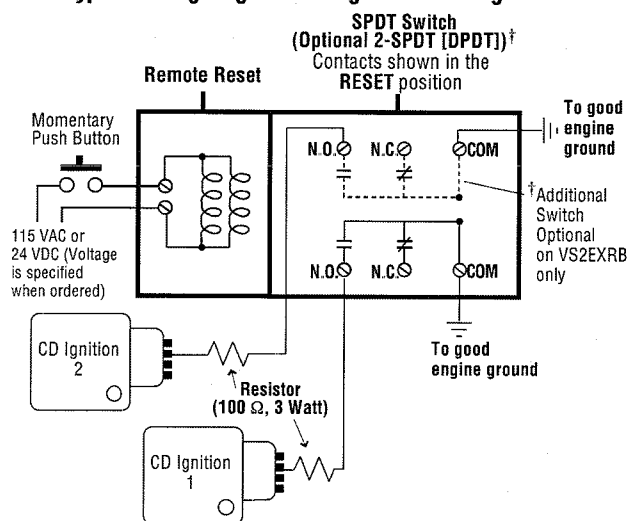
VS2 and VS2C
Typical Wiring Diagram for Single or Dual CD Ignition



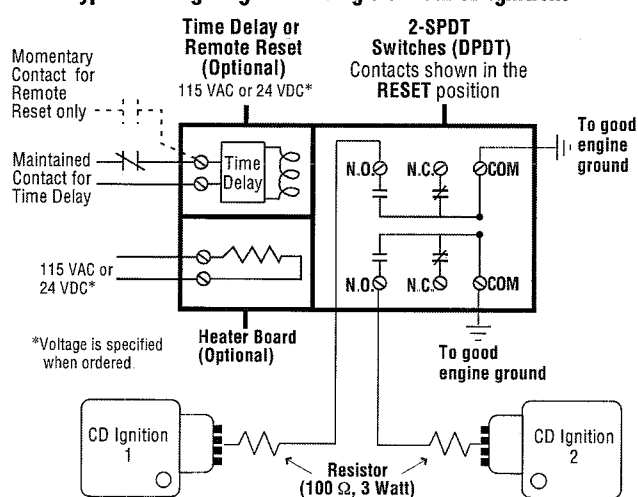
VS2EX
Typical Wiring Diagram for Single or Dual CD Ignitions



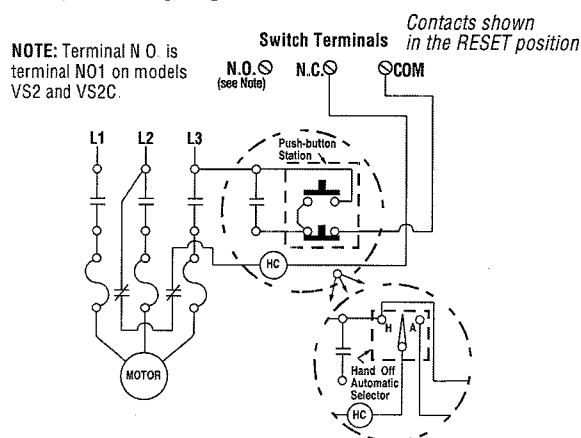
VS2EXR and VS2EXRB
Typical Wiring Diagram for Single or Dual CD Ignitions



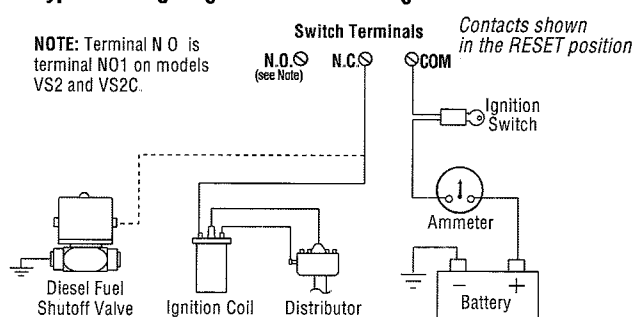
VS94
Typical Wiring Diagram for Single or Dual CD Ignitions



VS2, VS2C, VS2EX, VS2EXR, VS2EXRB and VS94
Typical Wiring Diagram for Electric Motors



VS2, VS2C, VS2EX, VS2EXR, VS2EXRB and VS94
Typical Wiring Diagram for Distributor Ignition or Diesel



SERVICE PARTS

PART NO.	DESCRIPTION
----------	-------------

VS2EXRB

20010090	Snap-switch and insulator kit (1 switch per kit) prior to September 1, 1995.*
20000288	Snap-switch and insulator kit (1 switch per kit) for models manufactured on September 1, 1995 or later.*
20000057	<i>Inside</i> snap-switch and insulator kit (1 switch per kit) for model VS2EXRB-D prior to September 1, 1995.*
20000058	<i>Outside</i> snap-switch and insulator kit (1 switch per kit) for model VS2EXRB-D prior to September 1, 1995.*
20000287	<i>Outside</i> snap-switch and insulator kit (1 switch per kit) for model VS2EXRB-D manufactured on September 1, 1995 or later.*
20000290	<i>Inside</i> snap-switch and insulator kit (1 switch per kit) for model VS2EXRB-D manufactured on September 1, 1995 or later.*
20050077	Adjustment shaft
20000262	Movement assembly
20000049	Reset solenoid assembly (115 VAC)
20000234	Reset solenoid assembly (24 VDC)

VS94 Series

25050506	Dust boot
00000232	Conduit fitting
20010090	Snap-switch and insulator kit (1 switch per assembly) prior to September 1, 1995.**
20000288	Snap-switch and insulator kit (1 switch per assembly) for models manufactured on September 1, 1995 or later.***

* If no date code is found, refer to the old switch. Models with date 0895 and before use old switch. Dated 0995 after, use straight snap-switch arm, no rollers

** Models dated Q1 thru Q8 (formed snap-switch arm and rollers).

*** Models date coded O9 thru O12 and R1 thru R12 (straight snap-switch arm, no rollers)

20010091	Movement assembly
20050087	Cover
00000309	Cover gasket
20010090	Snap-switch and insulator kit (1 switch per kit) prior to September 1, 1995.*
20000288	Snap-switch and insulator kit (1 switch per kit) for models manufactured on September 1, 1995 or later.*
20000289	C-clamp conversion mounting kit

20000262	Movement assembly
20050087	Cover
00000309	Cover gasket
20010090	Snap-switch and insulator kit (1 switch per kit) prior to September 1, 1995.*
20000288	Snap-switch and insulator kit (1 switch per kit) for models manufactured on September 1, 1995 or later.*
20000049	Reset solenoid assembly (115 VAC)
20000234	Reset solenoid assembly (24 VDC)
20000289	C-clamp conversion mounting kit

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Boston Gear®

ORC Series

Trig-O-Matic™

Overload Release Clutches

Installation and Maintenance Instructions

Doc. No.

ORC Series
Model S



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ORC SERIES, MODEL S CLUTCHES

ORC SERIES TRIG-O-MATIC™

OVERLOAD RELEASE CLUTCHES – STANDARD MODEL S

INSTALLATION AND MAINTENANCE INSTRUCTIONS

I. INTRODUCTION

A. Operating Principle

The ORC Series, Model S Overload Release Clutch consists of two basic components: the rotor and the housing assembly. The clutch rotor is keyed and secured to a shaft with a setscrew.

The housing assembly includes a drive pawl and a reset pawl which are pivoted within the clutch housing. The drive pawl is held engaged in the rotor notch by the combined compression of the drive and reset springs as shown in Figure 1. The combined compression of these two springs determines the maximum torque which will be transmitted without overload. With the clutch in the engaged position shown in Figure 1, the rotor and the housing are held together and the entire unit rotates with the drive shaft at the same speed.

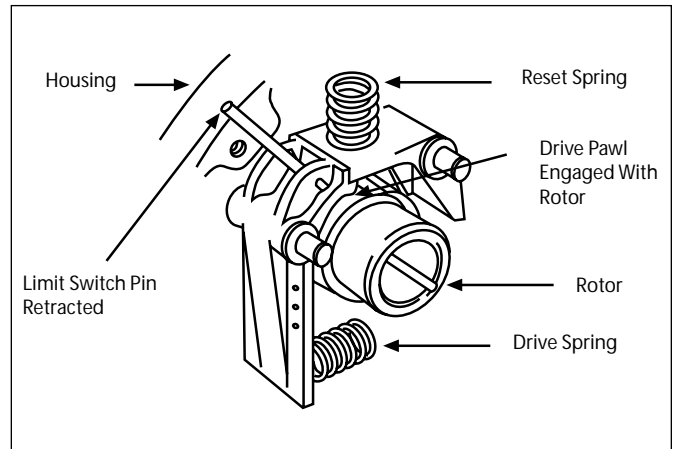


FIGURE 1 ENGAGED

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ORC SERIES, MODEL S CLUTCHES

When an overload occurs, the rotor rotates from its normal position within the housing. At this instant, the combined compression of the drive and reset springs is overcome. For a manual reset clutch, the drive pawl is forced out of its engaged position from the rotor and as it pivots up, the reset pawl lifts and locks the drive pawl out of contact with the rotor as shown in Figure 2. The clutch is then free to rotate until it is reset. For a clutch with the automatic reset feature, the reset pawl applies pressure to the top of the drive pawl, holding it in contact with the rotor as shown in Figure 3.

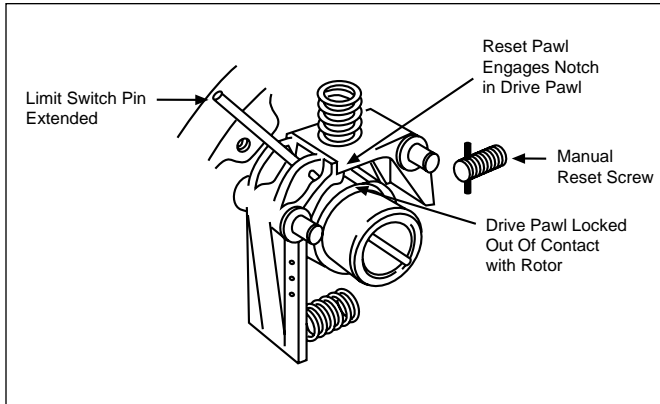


FIGURE 2 DISENGAGED MANUAL

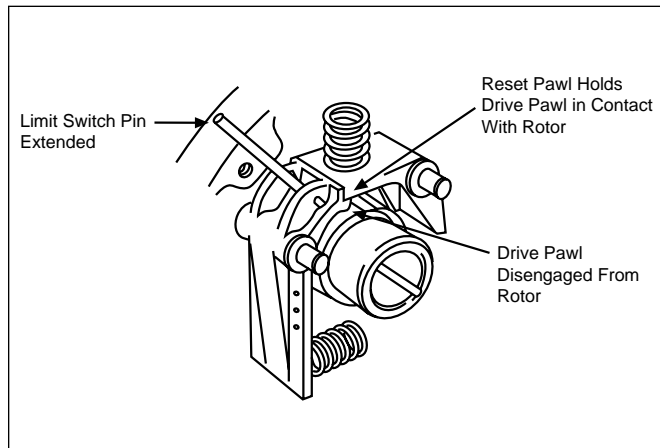


FIGURE 3 DISENGAGED AUTOMATIC

B. Resetting Instructions

1. Manual Reset

- After the overload condition has been corrected, rotate the drive until the rotor keyway is in alignment with the hole stamped 22 located on the outside diameter of the housing (see Figure 4).
- Reset the clutch by inserting a hex wrench into the reset screw shown in Figure 4, and turn the screw clockwise until the reset pawl releases the drive pawl. Refer to Table 5 for the proper wrench size.

Note:

Be sure not to use a powered wrench as it may cause damage to the reset pawl and/or reset spring!

- When the drive pawl enters the rotor notch, turn the wrench counterclockwise until the reset screw has stopped at its original position, which is approximately flush with the O.D. of the clutch housing. This is essential to restore the torque to its original setting.

2. Automatic Reset

After one complete revolution the drive pawl will automatically return to its original engaged position. After the overload condition has been corrected "jog" the drive until the drive pawl engages with the rotor.

C. Torque Adjustment

The clutch is supplied with a torque selector dial. This dial makes torque adjustments on the clutch possible. There are mill marks on the housing near the hole stamped 9 on the outside diameter of the housing. The mill marks have stamped values indicating a set, or minimum and maximum torque (see Figure 5). If a drastic change in torque is desired, it may be necessary to change springs. See Section VI for spring replacement.

1. Increasing the Torque.

- Disengage** the clutch.
- Turn the torque adjustment screw clockwise until it is flush with the milled depth of the desired torque setting and the red scribed lines are in line with each other.
- Reset the clutch and check its operation.

2. Decreasing the Torque.

- Make sure that the clutch is **engaged**.
- Turn the torque adjustment screw counterclockwise until it is flush with the milled depth of the desired torque setting and the red scribed lines are in line with each other.
- Disengage the clutch and check its operation.

- See Figure 6 for Limit Switch Actuating Mechanism adjustment.

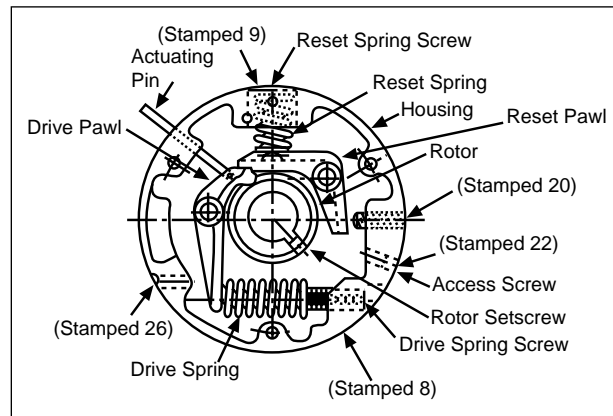


FIGURE 4 – CLUTCH INTERNAL COMPONENTS

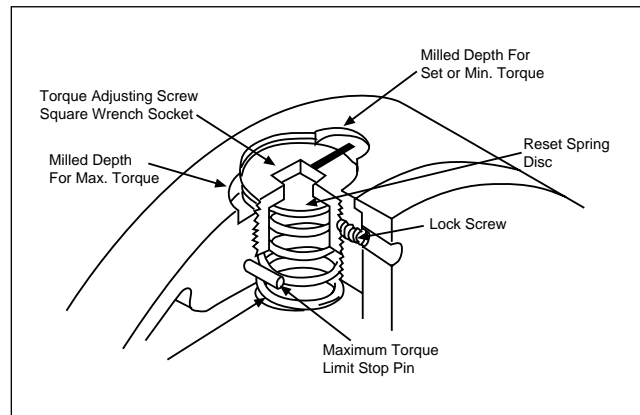


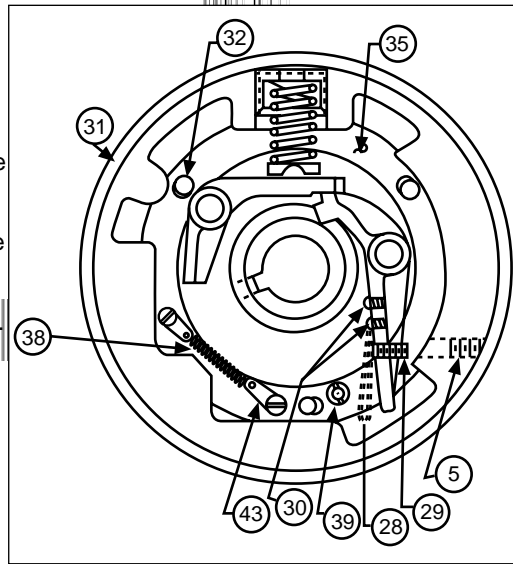
FIGURE 5

ORC SERIES, MODEL S CLUTCHES

LIMIT SWITCH ACTUATING MECHANISM (LSAM)

If the torque output of the clutch is altered, it may be necessary to adjust the actuating mechanism. This is accomplished by first disengaging the clutch, then removing access plug #5 and inserting an allen wrench into the actuating adjusting screw #29. (Refer to Table 5 for wrench sizes). Rotate adjusting screw #29 until the spring pressure applied by the actuating spring #28 against the actuating stud

nut #39 is sufficient to release the actuating plate #31. The adjustment should then be tested by resetting the clutch and then disengaging it. If the adjustment is correct, the actuating plate will release at the exact time of clutch disengagement. Replace plug #5.



- 5 Adjustment Access Plug
- 35 Release Ring
- 31 Actuating Plate
- 32 Trip Pin
- 38 Return Spring
- 39 Actuating Stud Nut
- 28 Actuating Spring
- 29 Actuating Adjusting Screw
- 30 Spring Mounting Screw
- 43 Spring Terminal

FIGURE 6

II. MOUNTING SPROCKETS OR SHEAVES TO CLUTCH

A. Type T Housing (Refer to Figure 7)

1. Inspect mating pilots on clutch and sprocket or sheave for nicks or burrs and remove as required.
2. Position sprocket or sheave on housing and align dowel pin holes.
3. Attach sprocket or sheave to housing with mounting bolts and high collar lock washers. Refer to Table 1 for recommended seating torques.
4. Finish ream sprocket or sheave for dowel pin. Refer to Table 1 for dowel pin and recommended ream sizes.
5. Install dowel pins to a point where they bottom in housing.

TABLE 1 - SPROCKET MOUNTING SCREW SEATING TORQUES

Size	Screw Size	Qty.	Dowel Size	Qty.	Seating Torque	Ream Size
1	1/4-20	3	1/4	1	150 in-lb	.2495
2	5/16-18	3	5/16	1	305 in-lb	.3120
3	3/8-16	4	3/8	1	545 in-lb	.3745
4	1/2-13	4	1/2	1	1,300 in-lb	.4995
5	5/8-11	6	5/8	1	2,530 in-lb	.6245
6	5/8-11	6	5/8	1	2,530 in-lb	.6245

B. Type B Housing

A Type B is a basic unit and is sold without any mounting hole arrangement. It is modified by the customer for special applications. Refer to Figure 8.

TABLE 2 - MINIMUM NUMBER OF TEETH OF STANDARD PLATE SPROCKETS ADAPTABLE TO TYPE T CLUTCH

Clutch Size	CHAIN SIZE AND PITCH										
	#25 1/4 Pitch	#35 3/8 Pitch	#40 1/2 Pitch	#41 1/2 Pitch	#50 5/8 Pitch	#60 3/4 Pitch	#80 1 Pitch	#100 1-1/4 Pitch	#120 1-1/2 Pitch	#140 1-3/4 Pitch	#180 2 Pitch
1	40	28	22	22	18	—	—	—	—	—	—
2	54	36	28	28	22	19	—	—	—	—	—
3	X	45	34	36	28	25	19	—	—	—	—
4	X	X	42	45	36	30	23	19	—	—	—
5	X	X	X	X	42	36	30	22	19	17	—
6	—	—	X	X	X	48	36	30	24	21	19

Notes:

1. X - On Application Only.
2. For smaller sprockets consult factory. As in most cases, a design modification can be made.

ORC SERIES, MODEL S CLUTCHES

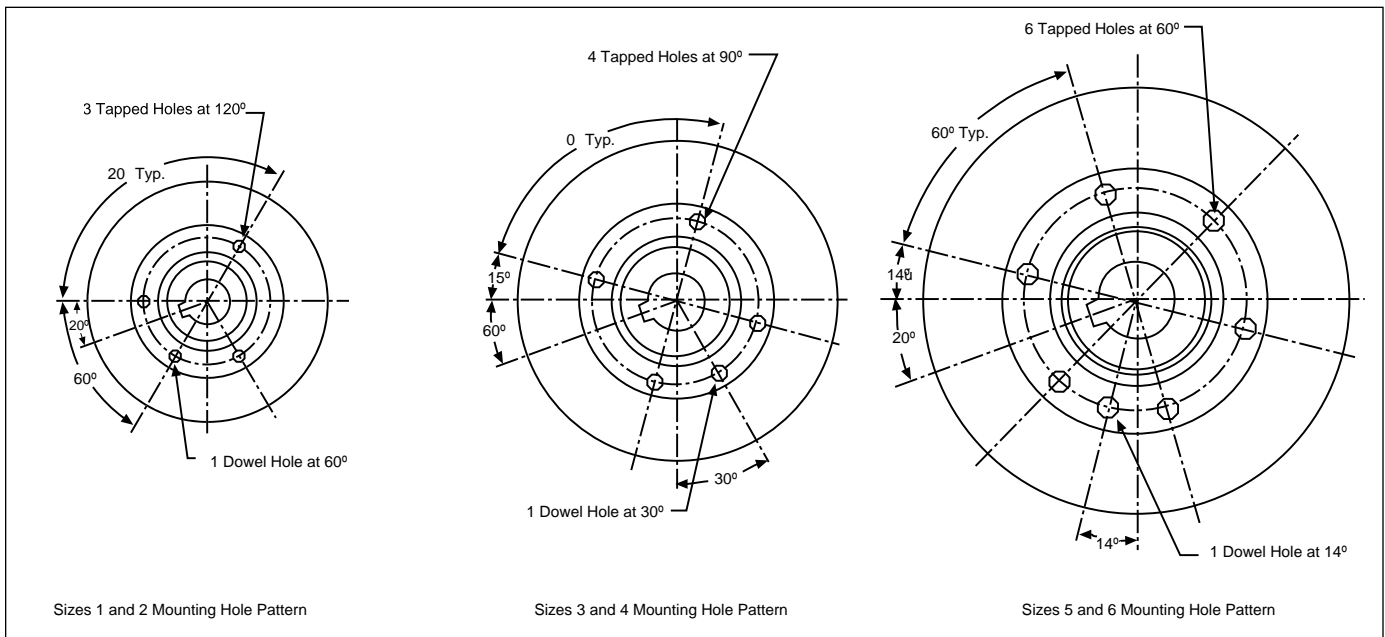


FIGURE 7 – TYPE T STANDARD MOUNTING HOLE PATTERNS

TABLE 3 - TYPE T MOUNTING HOLE PATTERNS

Size	Thread	Depth	Bolt Circle	Pilot Dia. +.000 -.002
1	1/4-20	.50	2.375	1.875
2	5/16-18	.50	3.000	2.250
3	3/8-16	.62	4.125	3.250
4	1/2-13	.87	5.000	3.203
5	5/8-11	1.00	6.250	4.125
6	5/8-11	1.00	8.750	6.000

Notes:

1. Mounting bolts must be minimum 160,000 PSI tensile, Rc 36-43.
2. Dowel pins must be minimum 150,000 PSI shear, Rc 50-58 core hardness.

TABLE 4 - TYPE B HOUSING DIMENSIONS

Size	A	B	C	D	E	F +.000 -.002	G
1	.81	.81	1.06	.11	.31	1.500	.69
2	.90	1.25	1.37	.18	.37	1.875	.81
3	1.25	1.62	1.94	.29	.50	2.750	.94
4	1.56	2.12	2.37	.43	.56	2.828	1.48
5	1.94	2.62	3.00	.58	.69	4.000	1.62
6	2.62	3.50	3.87	.90	.87	5.500	2.00

Note:

The "E" Dimension on Table 4 shows pawl trunnion holes. These holes are not through holes and they should be avoided when mounting a coupling, sprocket, etc. to the clutch.

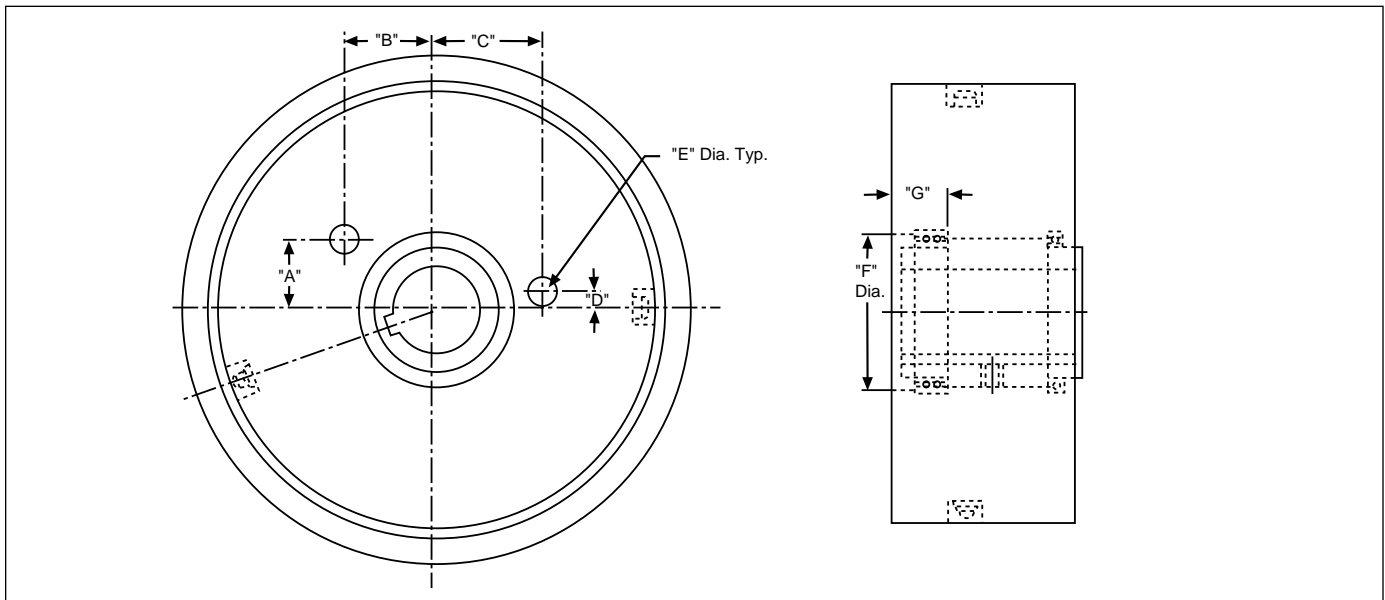


FIGURE 8 – TYPE B HOUSING CONFIGURATION

ORC SERIES, MODEL S CLUTCHES

III. LOCATING AND MOUNTING CLUTCH AND COUPLINGS TO SHAFT

A. Location

The clutch should always be located as close as possible to the source of an overload condition. Figures 9 through 12 indicate both preferred and not preferred locations for mounting an ORC Series, Model S Overload Release Clutch.

Note:

Clutch mounted sprockets, etc. and couplings should be positioned as close to a supporting bearing as possible to minimize overhung loads. A minimum shaft engagement of 1-1/2 times the shaft diameter is recommended for clutch and coupling flange installation.

1. Direct Drives

a. Figure 9 shows the **preferred** location for mounting in a direct drive application. The clutch is mounted on the low speed side of the reducer, and transmits power from its housing, through its rotor to the driven shaft.

b. Locating the clutch as shown in Figure 10 is **not preferred**. Here the clutch is mounted on the high-speed side of the reducer. Generally, mounting in this manner requires the clutch to be hypersensitive to perform satisfactorily.

2. Indirect Drives

a. Either location of the clutch shown in Figure 11 is **preferred** in indirect drive applications.

b. The mounting location in Figure 12 is **not preferred** for the same reasons as those for Figure 10. Always consult the factory when a mounting of this type is necessary.

B. Mounting Basic Clutch

1. Inspect shaft and key for any nicks or burrs and remove any that may be present.
2. Remove the access screw from the hole stamped 22 outside of the clutch housing. Make sure that the clutch is engaged where the rotor keyway is in line with the hole stamped 22.
3. Position shaft key and slide clutch onto shaft.
4. Align sprocket or sheave mounted to clutch with mating sprocket or sheave in drive train. Refer to installation and alignment instructions furnished with sprocket or sheave.

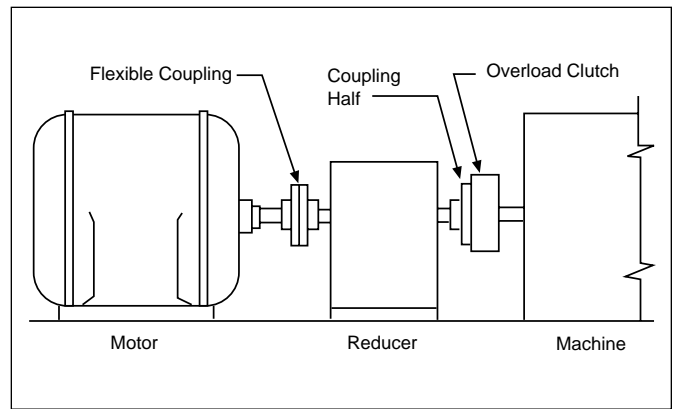


FIGURE 9

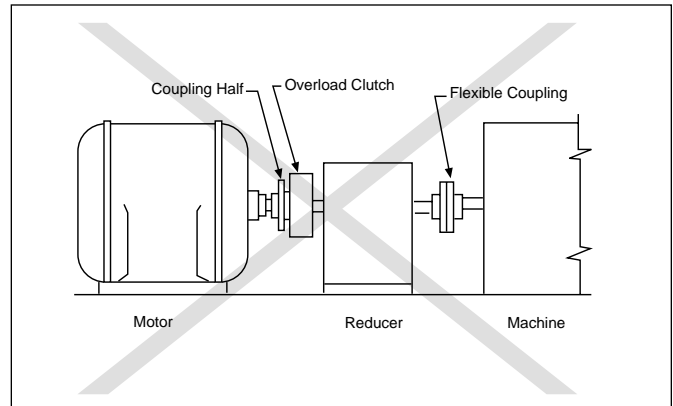


FIGURE 10

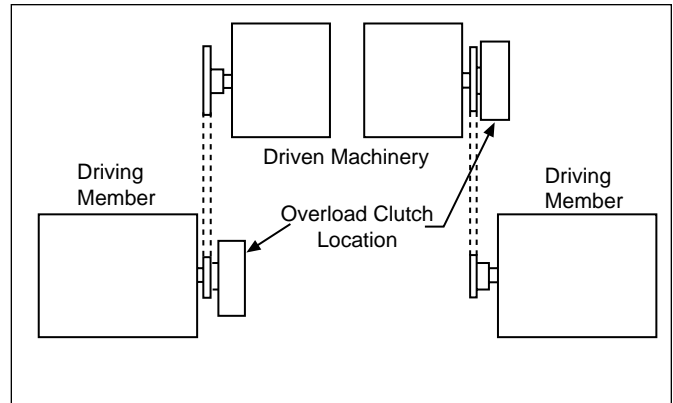


FIGURE 11

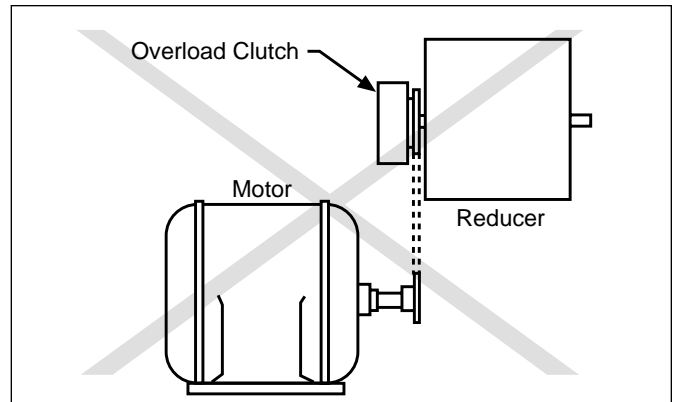


FIGURE 12

ORC SERIES, MODEL S CLUTCHES

TABLE 5 - WRENCH SIZE CHART

Clutch Size	Drive Spring Screw Hex Wrench	Reset Spring Screw Square Wrench	Manual Reset Screw Hex Wrench	Rotor Setscrew Hex Wrench	Access Screws Hex Wrench	Locking Screw Hex Wrench	Adjustment Screw Hex Wrench
1	3/16	3/8	3/16	3/32	1/8	3/32	1/16
2	1/4	3/8	1/4	1/8	5/32	3/32	5/64
3	5/16	1/2	5/16	3/16	3/16	1/8	1/8
4	5/16	1/2	3/8	1/4	5/16	1/8	1/8
5	3/8	1/2	1/2	5/16	5/16	1/8	1/8
6	3/4	3/4	1/2	5/16	5/16	1/8	1/8

- Select the correct hex wrench from Table 5 and insert it through the hole stamped 22 in the housing. Tighten the rotor setscrew securing the clutch to the shaft.

Note:

Turn wrench clockwise only! Do not remove setscrew from rotor!

Refer to Table 6 for recommended setscrew seating torques.

- Remove the hex wrench and replace access screw in the housing.

C. Mounting Type "C" Flexible Coupling

- After the clutch has been mounted on its shaft as explained in Section III, inspect the coupling shaft and key for any nicks or burrs and remove any that are present.
- Make sure that the coupling shaft keyway is in alignment with the clutch shaft keyway. Position shaft key and slide coupling onto the appropriate shaft.
- Slide the coupling flange onto the coupling studs. The coupling flange and adapter should be separated by a gap of 1/8".
- Secure the coupling to drive shaft by tightening the two setscrews located in the hub of the flange. Refer to Table 7 for recommended coupling setscrew seating torques.
- Parallel Alignment
 - Place a straightedge across the clutch housing and coupling flange as shown in Figure 13.
 - Measure the offset around the periphery of these two components **without rotating** the shafts.
 - If the difference in offset from any two points 180 degrees apart exceeds the maximum value shown in Table 8, the shafts must be realigned.
- Angular Alignment
 - Measure the gap around the periphery between the coupling flange and the clutch housing **without rotating** the shafts. Refer to Figure 14.
 - If the difference between any two points 180 degrees apart exceeds the maximum angular misalignment shown in Table 8, the shafts must be realigned.

TABLE 6 - ROTOR SETSCREW SEATING TORQUES

Size	Screw Size	Seating Torque
1	10-32	36 in-lb
2	1/4-28	87 in-lb
3	3/8-24	290 in-lb
4	1/2-20	620 in-lb
5	5/8-18	1,325 in-lb
6	5/8-18	1,325 in-lb

TABLE 7 - COUPLING SETSCREW SEATING TORQUES

Size	Setscrew Size	Seating Torque
1	5116-18	165 in-lb
2	3/8-16	290 in-lb
3	3/8-16	290 in-lb
4	1/2-13	620 in-lb
5	1/2-13	620 in-lb
6	1/2-13	620 in-lb

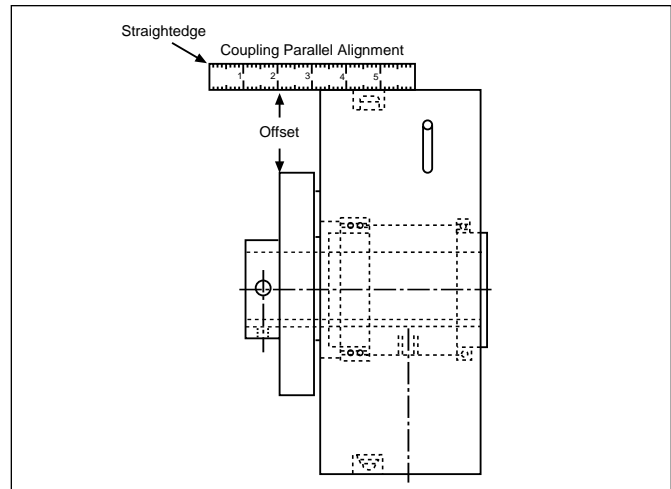


FIGURE 13

ORC SERIES, MODEL S CLUTCHES

- c. If a correction is required to satisfy angular alignment requirements, then recheck the parallel alignment.

TABLE 8 - TYPE "C" MISALIGNMENT

Size	Maximum Allowable Misalignment	
	Parallel	Angular
1	.012"	.074"
2	.015"	.091"
3	.016"	.102"
4	.027"	.159"
5	.031"	.183"
6	.045"	.231"

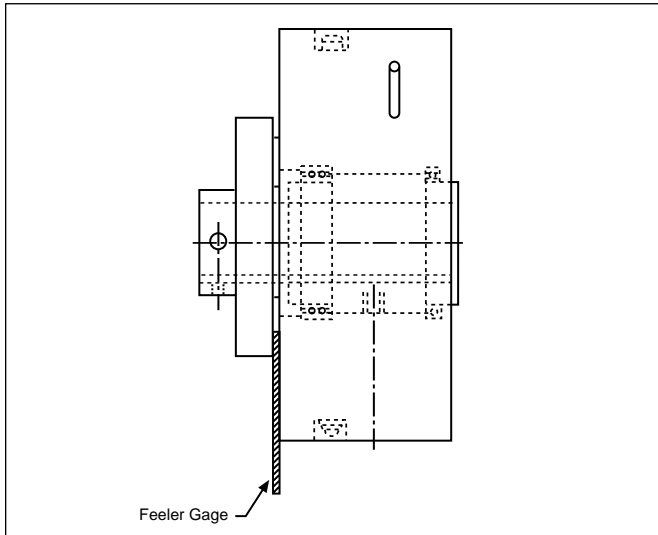


FIGURE 14

D. Mounting the "N" Index Coupling and Type "R" Rigid Coupling

1. After the clutch has been mounted on its shaft as explained in Section III, inspect mating pilots of clutch and coupling for any nicks or burrs and remove any that are present.
2. Inspect coupling shaft and key for any nicks or burrs and remove any that are present.
3. In the case of a Type "R", make sure that the coupling shaft keyway is in alignment with the clutch shaft keyway. Position the shaft key and slide the coupling flange onto the shaft.
4. Slide the coupling onto the clutch housing making sure that the coupling pilot fits into the housing pilot and that the mounting holes are aligned. In the case of a Type "N" index coupling, make sure that the desired mounting slots are aligned with the clutch housing mounting holes.

5. Secure the coupling to the drive shaft by tightening the two setscrews located in the hub of the flange. Refer to Table 7 for recommended setscrew seating torques.

6. Parallel Alignment

- a. Place a straightedge across the clutch housing and coupling flange as shown in Figure 13.
- b. Measure the offset around the periphery of these two components **without rotating** the shafts.
- c. The shafts must be aligned until no offset exists or is equal at all points around the periphery.

7. Angular Alignment

- a. Measure the gap around the periphery between the coupling flange and clutch housing **without rotating** the shafts. Refer to Figure 14.
- b. The shafts must be aligned until no gap exists or is equal at all points around the periphery.
- c. If a correction is required to satisfy angular alignment requirements, then recheck the parallel alignment.

Note:

The Type "N" and "R" coupling connection is rigid and does not allow for forgiveness of parallel or angular misalignment. To eliminate unnecessary bearing loads, both shafts must be in near perfect alignment.

8. Loosen the coupling setscrews and attach coupling to clutch with hex head bolts and flat washers. Refer to Table 9 for recommended bolt seating torques. Secure coupling to drive shaft by tightening the setscrews to the recommended seating torques in Table 7.

TABLE 10 - COUPLING MOUNTING BOLT SEATING TORQUES

Size	Bolt Size	Seating Torque
1	5/16-18	160 in-lb
2	3/8-16	280 in-lb
3	1/2-13	700 in-lb
4	5/8-11	1,200 in-lb
5	5/8-11	1,200 in-lb
6	5/8-11	1,200 in-lb

ORC SERIES, MODEL S CLUTCHES

IV. LIMIT SWITCHES

The ORC Series, Model S Overload Release Clutch is available with two types of limit switch actuators, a limit switch pin (LSAP) and a limit switch actuating mechanism (LSAM).

A. Limit Switch Pin

A Limit Switch Pin is furnished as a standard item to activate a limit switch that triggers the electrical controls. The Limit Switch Pin protrudes radially from the clutch housing and its travel is controlled by the drive pawl motion upon disengagement. The Limit Switch Pin can be used if the housing continues to rotate when an overload occurs and the rotor stops, i.e., the housing is the driver and the rotor is the driven. Housing RPM has to be considered to determine the time for the Limit Switch Pin to revolve around before contacting the limit switch. See Figure 15 for Limit Switch Pin Travel.

The standard Limit Switch Pin extension is 1 inch from the outside diameter of the clutch housing. It can also be made flush with the surface of the housing in an engaged position.

B. Limit Switch Actuating Mechanism

A Limit Switch Actuating Mechanism provides instant operation of a limit switch to immediately shut down the drive or actuate an alarm should an overload occur.

The mechanism is entirely contained in the clutch cover and is actuated by the motion of the drive pawl. When an overload occurs, the drive pawl motion releases the actuating plate and it trips a limit switch. The total travel of the plate is 5/16 of an inch (see Figure 15).

The actuating plate must be reset by manually pushing it back into position. The clutch must be engaged when resetting the plate or the plate will not reset when the clutch is disengaged.

A limit switch should be able to operate within the plate travel of 5/16 of an inch. The switch should be wired in parallel with a jog circuit so that the drive can then be indexed to the start/run circuit.

V. GENERAL MAINTENANCE

A. Lubrication

The Overload Release Clutch is prelubricated at the factory and is also equipped with a grease pack fitting. For optimum performance and wear resistance it is suggested that the clutch be lubricated with a Bentone type, NLGI grade 0 grease. The lubrication schedule should be in accordance with good operating practices for the equipment on which the clutch is mounted. The clutch is also supplied with a grease relief fitting. When there is enough grease in the clutch any excess grease will be extruded through the relief fitting.

B. Annual Inspection

The Overload Release Clutch is constructed of heavy duty materials. Under reasonably clean conditions the unit will operate with a minimum of maintenance. A scheduled annual inspection of bearings, pawls, rotor, springs, tripping mechanism, and other internal components is suggested. However, the actual frequency should be in accordance with good operating practices for the equipment on which the clutch is installed.

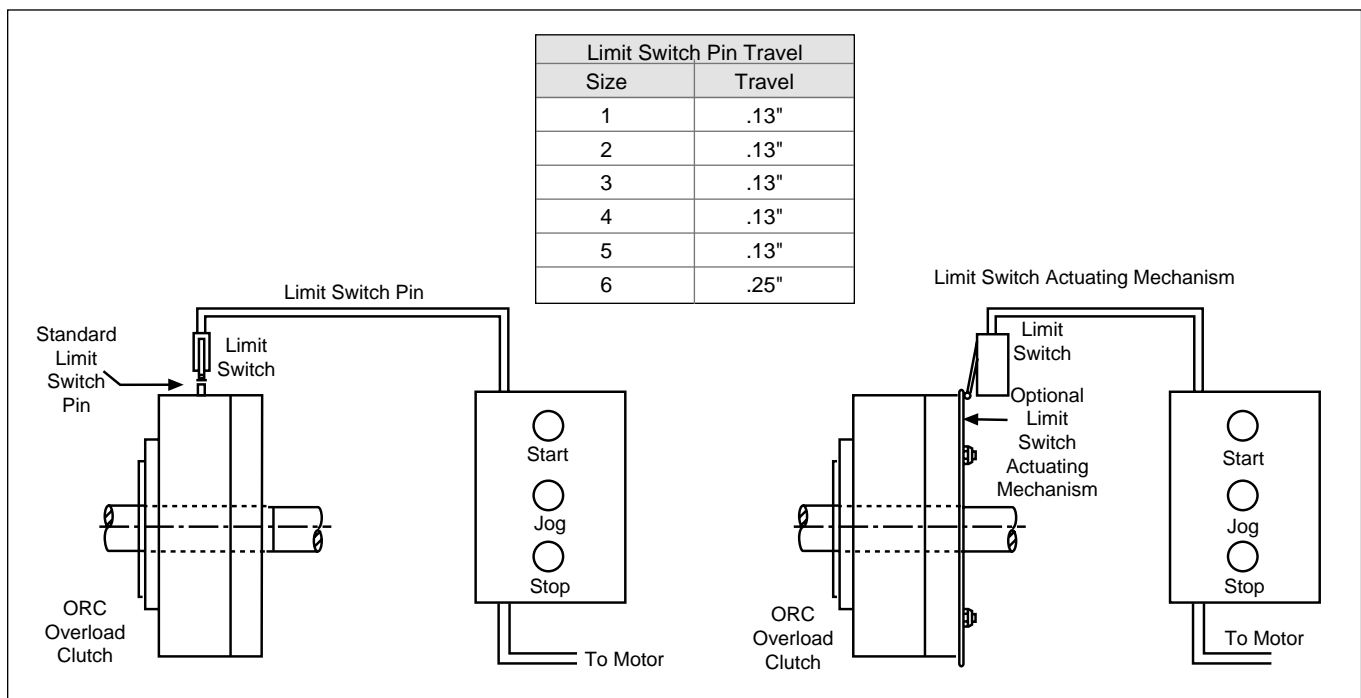


FIGURE 15 – LIMIT SWITCH LAYOUT

ORC SERIES, MODEL S CLUTCHES

VI. REPAIR INSTRUCTIONS

A. General Disassembly

1. All item numbers in parenthesis will refer to the key numbers shown in the clutch exploded view drawing and parts identification tables.
2. Place the clutch preferably in a three-jaw chuck with the actuating plate or cover facing up.
3. There are two locking screws (25) located on the face of the cover which lock down the reset spring screw (14) and the drive spring screw (21). Loosen these screws to relieve the pressure on the drive spring screw and reset spring screw.
4. Turn the reset spring screw (14) counterclockwise to relieve the compression on the reset spring (19).
5. Remove the sealing wax from the drive spring screw (21) and turn the screw counterclockwise to relieve the compression on the drive spring (18).
6. Remove the cover screws (27).
7. Pry off the cover (8). Use care not to break the inner pilot of the cover (see Figure 16).
8. Remove the reset screw (14) and take out the reset spring (19), and the ball thrust (20) through the hole stamped 9.

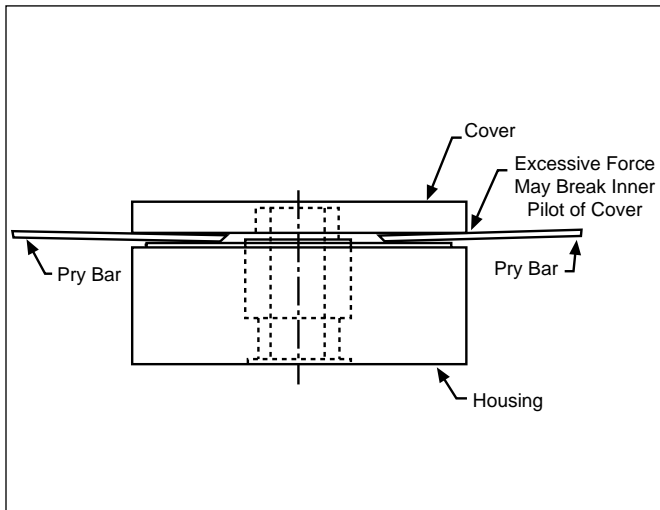


FIGURE 16

9. Remove the reset pawl (11) by simply lifting out.
10. Remove the drive pawl (10) and the drive spring (18). This will require a little more effort because of the slight pressure on the drive spring.

11. Remove the housing (1) from the mounting surface and press out the rotor (12).
12. If clutch is manual reset, remove the reset screw (24) by turning clockwise into the housing.
13. Inspect hardened bushings (3) in housing (1) and cover (8) for excessive wear.
14. Replace any worn or broken parts.

B. Basic Unit Assembly

1. If clutch is manual reset, install the reset screw (24) from the inside of the housing turning counterclockwise until the reset screw pin stops the screw from turning.
2. Press the long end of rotor (12) into housing bearing (2).
3. This step is for manual reset only. Go to next step for automatic reset. Install the drive pawl (10) into the appropriate hole in the housing (1), and the reset pawl (11) into its appropriate hole in the housing. Check the fit of the reset pawl into the notch of the drive pawl with the clutch disengaged. The reset pawl should fit approximately one-third of the way into the notch. Grinding the nose of the reset pawl may be necessary to obtain the proper fit (see Figure 17).

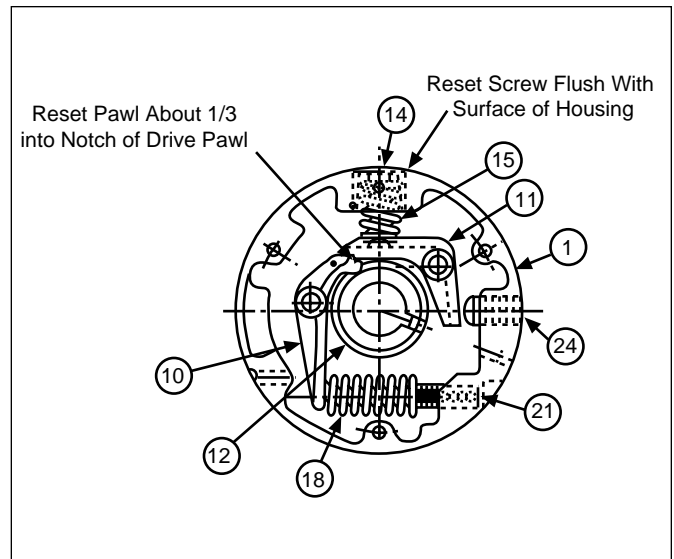


FIGURE 17

ORC SERIES, MODEL S CLUTCHES

4. Remove the drive pawl (10). The drive pawl and the drive spring (18) will have to be installed simultaneously. If a drastic change in torque is desired, use this step to change the drive spring. Place one end of the drive spring over the drive spring thrust washer (22). Insert the knob of the drive pawl into the other end of the drive spring. Insert the trunnion of the drive pawl into the hardened bushing in the housing, while the nose of the drive pawl fits into the notch of the rotor (12).
5. Coat the inside of the housing and all components with a quality all-purpose grease. A Bentone type, NLGI grade 0 grease or equivalent is recommended.
6. Insert the reset spring disc (15) inside the reset spring screw (14). Apply grease to the surface of the disc.
7. If a drastic change in torque is desired, use this step to change the reset spring. Place the reset spring (19) on the surface of the reset spring disc. Apply grease to the end of the ball thrust (20) and insert ball thrust into the reset spring.
8. Apply grease to the threads of the reset spring screw (14) and insert the assembly of the reset spring screw, reset spring disc (15), reset spring (19), and ball thrust (20) through the hole stamped 9 on the housing. Tighten the reset spring screw until it is flush with the surface of the housing (Figure 17).
9. Fill the entire housing cavity with grease to ensure a proper grease packing.
10. Press the cover on to the housing assembly. Make sure that the trunnion holes and the cover screw holes line up.
11. Install the cover screws and tighten to the recommended seating torques in Table 13.

TABLE 13 - COVER SCREW SEATING TORQUES

Clutch Size	Screw Size	Qty.	Seating Torque
1	1/4-20	3	100 in-lb
2	5/16-18	3	200 in-lb
3	3/8-16	3	350 in-lb
4	1/2-13	4	850 in-lb
5	5/8-11	4	1,700 in-lb
6	5/8-11	4	1,700 in-lb

C. Torque Verification

1. Place the clutch in a chuck or vise with the cover facing upward.
2. Insert the appropriate size arbor and key into rotor (see Figure 18).

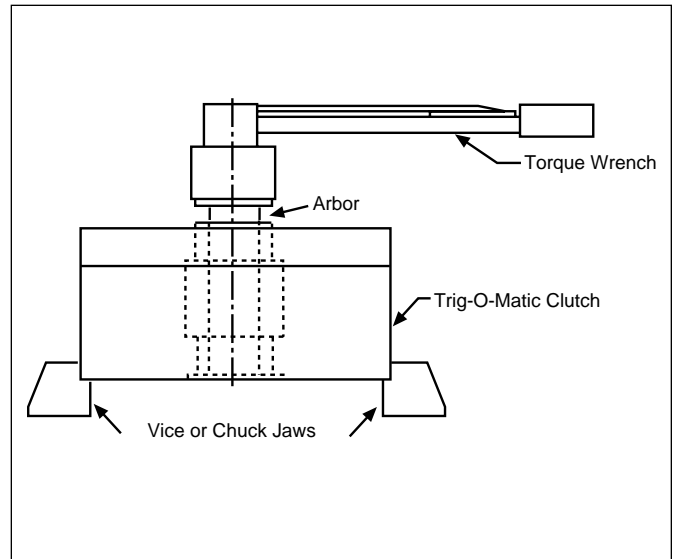


FIGURE 18

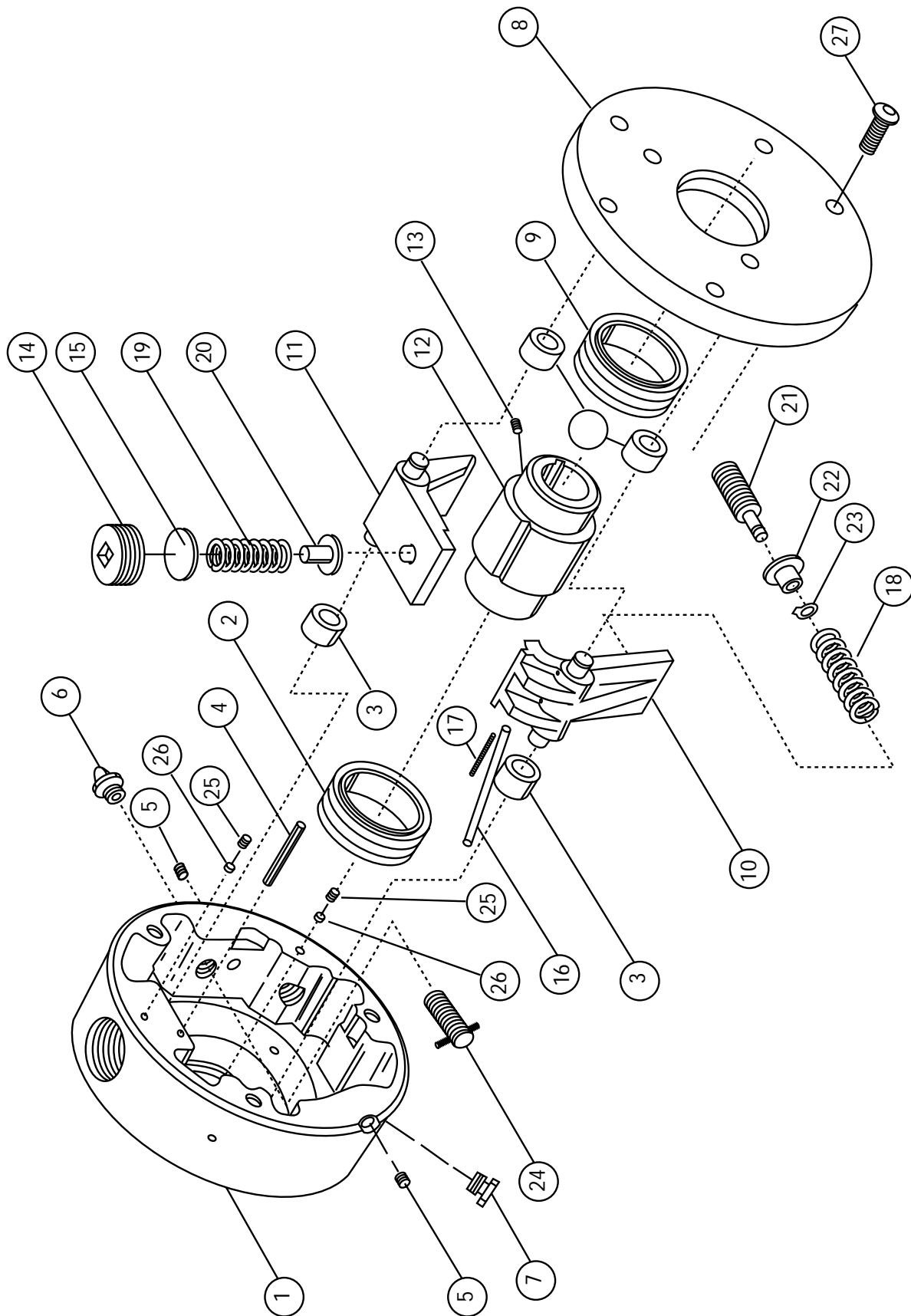
3. Turn the drive spring screw (21) clockwise until it is flush with the surface of the housing.
4. The clutch is supplied with a torque selector dial. The torque selector dial is the mill marks located at the hole stamped 9 on the housing. If a drive spring (18), reset spring (19), and/or a reset spring screw (14) were replaced, chances are that the stamped torque values on the dial are no longer valid. It may be necessary to grind the old numbers off and to stamp new ones.
5. Tighten the reset spring screw (14) until it reaches the limit stop pin (4). This will be the maximum torque position. If the maximum torque is not desired, tighten the reset spring screw to one of the locations on the torque selector dial.
6. Disengage the clutch with a torque wrench. Fine tune the torque by turning the drive spring screw (21) until the desired release torque is obtained.
7. Refer to Section I, C for further details on torque adjustment.
8. Once the desired release torque is obtained, tighten the locking screws (25) located over the drive spring and reset spring screws to ensure that they will not move. The unit is now ready for installation. Refer to Section III for installation of basic clutch.

ORC SERIES, MODEL S CLUTCHES

D. Limit Switch Actuating Mechanism (LSAM) Assembly

1. Apply a graphite lubricant to the release ring groove of the cover (8).
2. Insert the actuating stud (40) through the appropriate hole in the release ring (35). To identify this hole place the release ring in the groove of the cover. When the trip pin holes line up with the through holes of the cover, the actuating stud hole will line up with the counterbored hole in the groove of the cover.
3. Install the actuating stud nut (39) onto the actuating stud (40) and tighten.
4. Install a spring terminal (43) on each end of the return spring (38). Clutch sizes 5 & 6 require two return springs.
5. Insert a spring terminal screw (41) through the hole of the spring terminal (43), and place a spacer collar (36) on the end of the screw. Insert the end of the screw into the threaded hole of the release ring (35) and tighten. The end of the screw may protrude past the release ring. Grind the end of the screw flush with the surface of the release ring. Install second spring terminal screw on clutch sizes 5 & 6 as just described. Move to Step 13 for clutch sizes 5 & 6.
6. Press the trip pins (32) into the trip plate (31).
7. Install a bowed snap ring (34) into the groove of each trip pin located next to the trip plate.
8. Place the trip plate flat on a table with counterbored holes facing up. Insert the thrust springs (37) into the counterbores.
9. Place the cover (8) over the trip plate, lining up the counterbores in the cover with the springs.
10. Place the release ring (35) into the groove of the cover. Make sure that all of the holes line up properly.
11. Insert a spring terminal screw (41) through the hole of the other spring terminal (43) and place a spacer collar (36) on the end of the screw. Insert the end of the screw into the tapped hole of the cover and tighten.
12. Push down on the cover and release ring until the release ring engages into the grooves of the trip pins. Install two snap rings (33) into the grooves of each trip pin. Move to Step 22.
13. Place the release ring (35) into the groove of the cover. Make sure that all of the holes are properly aligned.
14. Insert the trip pins (32) through the matching holes in the release ring (35) and cover (8). Make sure that the tapped hole of the trip pin is inserted first.
15. Slide the release ring (35) counterclockwise so that the ring engages into the grooves of the trip pins.
16. Insert a spring terminal screw (41) through the other spring terminal (43) and place a spacer collar (36) on the end of the screw. Insert the screw into the tapped hole in the cover and tighten. Repeat this process for the other return spring .
17. Turn the cover over so that the release ring is facing down against the surface of the table.
18. Insert the thrust springs (37) into the counterbores of the cover.
19. Place the trip plate (31) over the cover making sure that the springs will sit in the counterbores of the trip plate and that all the holes properly line up.
20. Press down on the trip plate (31) until it stops against the trip pins.
21. While pressing down on the trip plate (31) insert the plate mounting screws (42) into the tapped holes of the trip pins and tighten.
22. Press the cover assembly onto the housing assembly (1). Make sure that the trunnion holes and the mounting screw holes line up.
23. Install the cover screws (27) and tighten to the recommended seating torques shown in Table 13.

ORC SERIES, MODEL S CLUTCHES



ORC SERIES, MODEL S WITH LIMIT SWITCH PIN (LSAP) TYPES SA & SM

ORC SERIES, MODEL S CLUTCHES

PART IDENTIFICATION - MODEL S WITH LIMIT SWITCH PIN (LSAP) TYPES SA & SM

Key No.	Name	Size 1 (Qty.)	Size 2 (Qty.)	Size 3 (Qty.)	Size 4 (Qty.)	Size 5 (Qty.)	Size 6 (Qty.)
*1	T Housing Ass'y., or	711257-XXX (1)	711148-XXX (1)	711180-XXX (1)	711223-XXX (1)	711238-XXX (1)	711266-XXX (1)
	B Housing Ass'y., or	711258-XXX (1)	711149-XXX (1)	711181-XXX (1)	711224-XXX (1)	711239-XXX (1)	711267-XXX (1)
	C Housing Ass'y., or	711259-XXX (1)	711150-XXX (1)	711182-XXX (1)	711225-XXX (1)	711240-XXX (1)	711268-XXX (1)
	N/R Housing Ass'y.	711260-XXX (1)	711151-XXX (1)	711183-XXX (1)	711226-XXX (1)	O/A	O/A
2	Housing Bearing	039273-041 (1)	039273-043 (1)	039273-044 (2)	039273-038 (1)	711900-006 (1)	711900-008 (1)
3	Hardened Bushing	—	730634-002 (2)	730634-003 (2)	730634-004 (2)	730634-005 (2)	—
4	Limit Stop Pin	730422-001 (1)	730422-001 (1)	730422-002 (1)	730422-002 (1)	730422-003 (1)	730422-003 (1)
5	Access Screws	040940-031 (2)	040940-042 (2)	074102-003 (2)	074102-078 (2)	074102-078 (2)	040940-078 (2)
6	Grease Fitting	034186-029 (1)	034186-029 (1)	034186-029 (1)	034186-029 (1)	034186-029 (1)	034186-029 (1)
7	Relief Fitting	034186-028 (1)	034186-028 (1)	034186-028 (1)	034186-028 (1)	034186-028 (1)	034186-028 (1)
8	Cover Ass'y	711261-001 (1)	711146-001 (1)	711185-001 (1)	711219-001 (1)	711242-001 (1)	711269-001 (1)
9	Cover Bearing	039273-040 (1)	039273-042 (1)	039273-045 (1)	039273-038 (1)	711900-005 (1)	711900-007 (1)
3	Hardened Bushing	—	730634-002 (2)	730634-003 (2)	730634-004 (2)	730634-005 (2)	—
10	Drive Pawl	730429-001 (1)	730430-001 (1)	730431-001 (1)	730432-001 (1)	730433-001 (1)	730434-001 (1)
*11	Reset Pawl	730367-XXX (1)	730368-XXX (1)	730369-XXX (1)	730370-XXX (1)	730371-XXX (1)	730372-XXX (1)
12	Rotor Assembly	710354-001 (1)	710354-002 (1)	710354-003 (1)	710354-004 (1)	710354-005 (1)	710354-006 (1)
13	Rotor Setscrew	043243-012 (1)	043243-022 (1)	043243-041 (1)	** (1)	043243-058 (1)	043243-058 (1)
14	Reset Spring Screw	730382-001 (1)	730382-002 (1)	730382-003 (1)	730382-004 (1)	730382-005 (1)	730382-006 (1)
15	Reset Spring Disc	730383-001 (1)	730383-002 (1)	730383-003 (1)	730383-004 (1)	730383-005 (1)	730383-006 (1)
	LSAP Assembly	710355-001 (1)	710355-002 (1)	710355-003 (1)	710355-004 (1)	710355-005 (1)	710355-006 (1)
16	Actuating Pin	730384-001 (1)	730384-002 (1)	730384-003 (1)	730384-004 (1)	730384-005 (1)	730384-006 (1)
17	Roll Pin	040942-044 (1)	040942-044 (1)	040942-045 (1)	040942-045 (1)	040942-046 (1)	040942-045 (1)
18	A-Drive Spring or	730385-001 (1)	730385-007 (1)	730385-014 (1)	730385-020 (1)	730385-026 (1)	730385-032 (1)
	B-Drive Spring or	730385-002 (1)	730385-008 (1)	730385-015 (1)	730385-021 (1)	730385-027 (1)	730385-033 (1)
	C-Drive Spring	730385-003 (1)	730385-009 (1)	730385-016 (1)	730385-022 (1)	730385-028 (1)	730385-034 (1)
19	A-Reset Spring, or	730385-004 (1)	730385-010 (1)	730385-017 (1)	730385-023 (1)	730385-029 (1)	730385-035 (1)
	B-Reset Spring, or	730385-005 (1)	730385-011 (1)	730385-018 (1)	730385-024 (1)	730385-030 (1)	730385-036 (1)
	C-Reset Spring, or	730385-006 (1)	730385-012 (1)	730385-019 (1)	730385-025 (1)	730385-031 (1)	730385-037 (1)
	D-Reset Spring	—	730385-013 (1)	—	—	—	—
20	Ball Thrust	—	730386-001 (1)	730386-002 (1)	730386-003 (1)	730387-001 (2)	730387-002 (2)
21	Drive Spring Screw	730379-001 (1)	730379-002 (1)	730379-003 (1)	730379-003 (1)	730380-001 (1)	730381-001 (1)
22	Drive Spring Washer	730388-001 (1)	730388-002 (1)	730388-003 (1)	730388-003 (1)	730388-004 (1)	730388-005 (1)
23	Snap Ring	—	040682-029 (1)	040682-030 (1)	040682-030 (1)	040682-030 (1)	040682-031 (1)
24	Reset Screw Ass'y.	710356-001 (1)	710356-002 (1)	710356-003 (1)	710356-004 (1)	710356-005 (1)	710356-006 (1)
25	Locking Screw	074102-015 (2)	074102-015 (2)	074102-031 (2)	074102-031 (2)	074102-027 (2)	074102-027 (2)
26	Locking Insert	730389-001 (2)	730389-001 (2)	730389-002 (2)	730389-002 (2)	730389-003 (2)	730389-003 (2)
27	Cover Screw	041315-048 (3)	041315-062 (3)	041315-077 (3)	041315-106 (4)	041315-121 (4)	041315-021 (4)

*Dash Numbers Are:

T Housing Ass'y.

B Housing Ass'y.

C Housing Ass'y.

N/R Housing Ass'y.

Reset Pawl

SA/SB/SC

Automatic

-001

-001

-001

-001

-001

SM/SP/SS

Manual

-002

-002

-002

-002

-003

**Dependent upon bore—consult the factory.

Note:

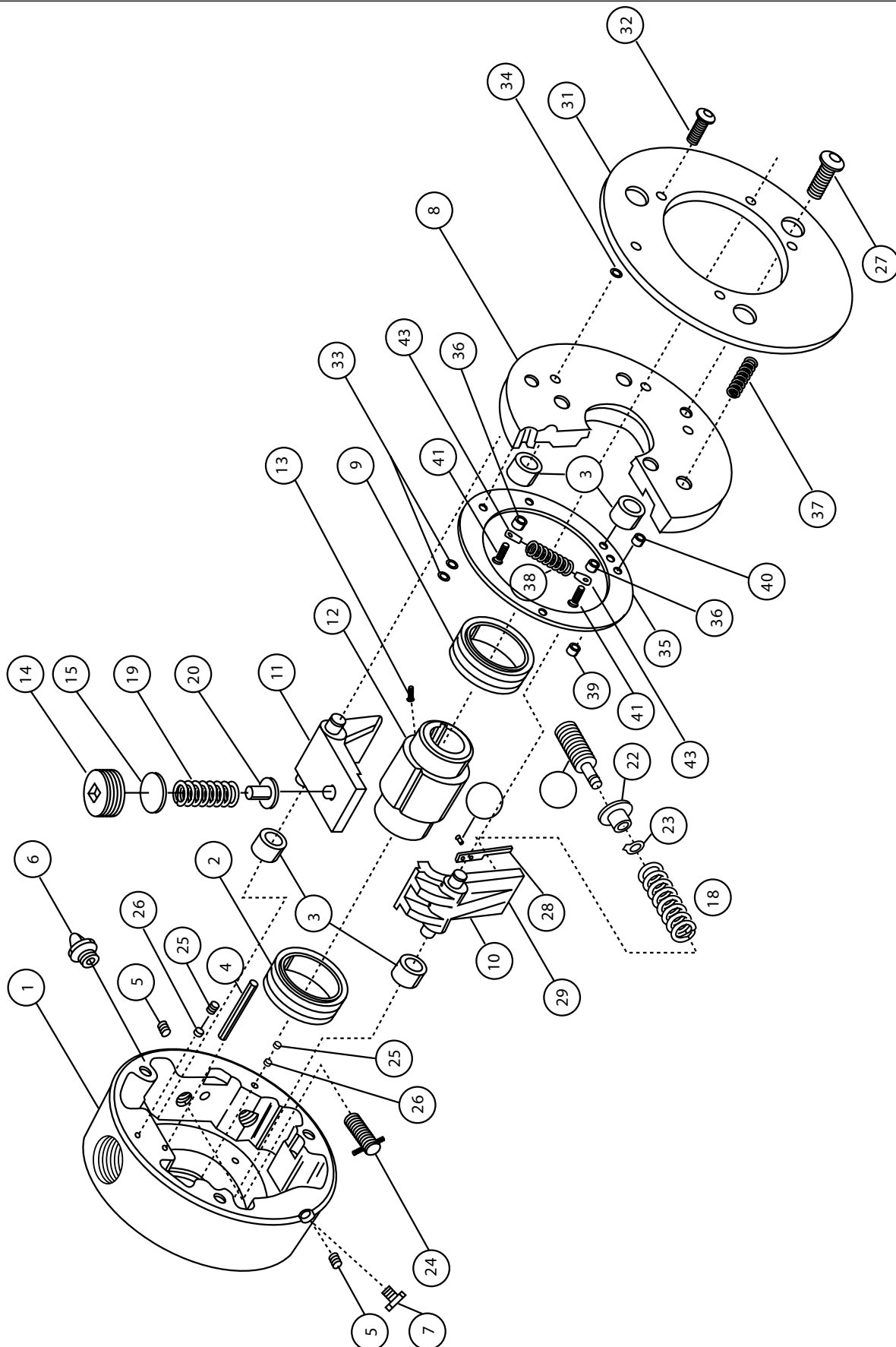
Please include clutch catalog number when ordering any spare parts.

CAUTION!

Rotating equipment is potentially dangerous and could cause injury or damage if not properly protected. Follow all

In accordance with our established policy to constantly improve our products, the specifications contained herein are subject to change without notice.

ORC SERIES, MODEL S CLUTCHES



ORC SERIES, MODEL S WITH LIMIT SWITCH ACTUATING MECHANISM (LSAM) TYPES SB, SC, SP & SS

ORC SERIES, MODEL S CLUTCHES

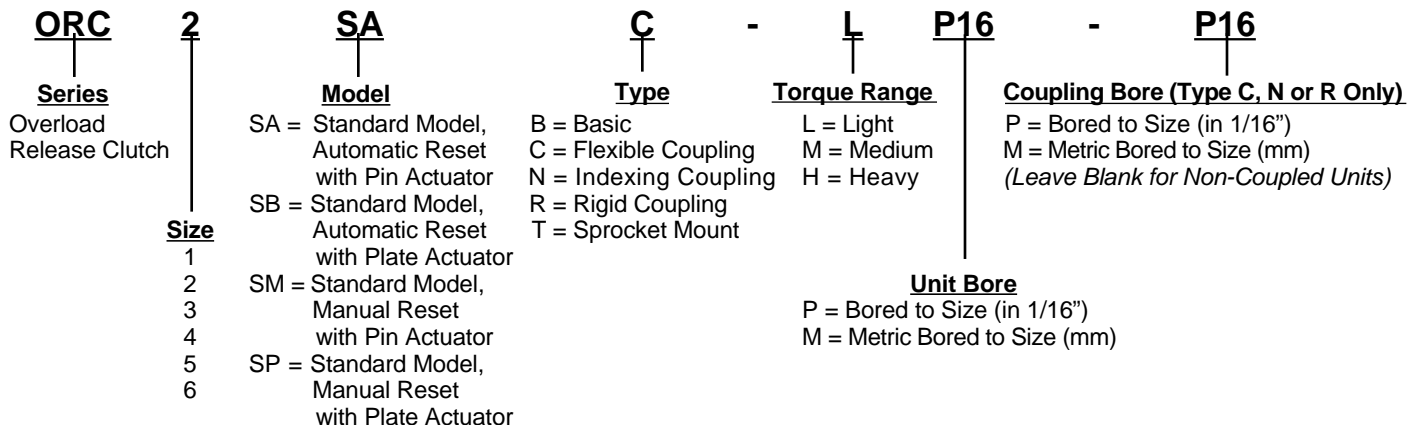
PART IDENTIFICATION - MODEL S WITH LIMIT SWITCH ACTUATING MECHANISM (LSAM) TYPES SB, SC, SP & SS

Key No.	Name	Size 1 (Qty.)	Size 2 (Qty.)	Size 3 (Qty.)	Size 4 (Qty.)	Size 5 (Qty.)	Size 6 (Qty.)
8	Cover Ass'y. (LSAM)	711262-001 (1)	711187-001 (1)	711108-001 (1)	710766-001 (1)	711190-001 (1)	711270-001 (1)
9	Cover Bearing	039273-040 (1)	039273-042 (1)	039273-045 (1)	039273-038 (1)	711900-005 (1)	711900-007 (1)
3	Hardened Bushing	—	730634-002 (2)	730634-003 (2)	730634-004 (2)	730634-005 (2)	—
10	Drive Pawl (LSAM)	710290-001 (1)	710291-001 (1)	710292-001 (1)	710293-001 (1)	710294-001 (1)	710295-001 (1)
28	Actuating Spring	730414-001 (1)	730415-001 (1)	730416-001 (1)	730417-001 (1)	730418-001 (1)	730419-001 (1)
29	Adjustment Screw	018006-004 (1)	018006-017 (1)	018006-047 (1)	018006-047 (1)	018006-047 (1)	018006-047 (1)
30	Mounting Rivet/Screw	730420-001 (2)	730420-001 (2)	730420-002 (2)	730420-002 (2)	730420-002 (2)	074110-018 (2)
	Plate Ass'y (SB/SP), or Plate Ass'y (SC/SS)	710204-001 (1) 710204-002 (1)	710205-001 (1) 710205-002 (1)	710206-001 (1) 710206-002 (1)	710207-001 (1) 710207-002 (1)	— —	— —
31	Plate (SB/SP), or Plate (SC/SS)	730397-001 (1) 730397-002 (1)	730398-001 (1) 730398-002 (1)	730399-001 (1) 730399-002 (1)	730400-001 (1) 730400-002 (1)	730401-001 (1) 730401-002 (1)	730402-001 (1) 730402-002 (1)
32	Trip Pin	730403-001 (3)	730404-001 (3)	730405-001 (3)	730406-001 (4)	730407-001 (4)	730408-001 (4)
33	Snap Ring	040682-035 (6)	040682-035 (6)	040682-036 (6)	040682-030 (8)	—	—
34	Bowed Snap Ring	040682-032 (3)	040682-032 (3)	040682-033 (3)	040682-034 (4)	—	—
35	Release Ring	730391-001 (1)	730392-001 (1)	730393-001 (1)	730394-001 (1)	730395-001 (1)	730396-001 (1)
36	Spacer Collar	730409-001 (2)	730409-002 (2)	730409-002 (2)	730409-002 (2)	730409-002 (4)	730409-002 (4)
37	Thrust Spring	730410-001 (3)	730410-002 (3)	730410-002 (3)	730410-002 (4)	730410-002 (4)	730410-003 (4)
38	Return Spring	730411-002 (1)	730411-001 (1)	730411-002 (1)	730411-001 (1)	730411-002 (2)	730411-001 (2)
39	Actuating Stud Nut	730412-001 (1)	730412-002 (1)	730412-003 (1)	730412-004 (1)	730412-004 (1)	730412-004 (1)
40	Actuating Stud	074111-126 (1)	074111-126 (1)	730413-001 (1)	730413-002 (1)	730413-002 (1)	730413-002 (1)
41	Terminal Screw	074110-003 (2)	074110-017 (2)	074110-017 (2)	074110-017 (2)	074110-017 (4)	074110-017 (4)
42	Plate Mounting Screw	—	—	—	—	730561-001 (4)	730561-002 (4)
43	Spring Terminal	730421-001 (2)	730421-002 (2)	730421-002 (2)	730421-002 (2)	730421-002 (4)	730421-002 (4)
	C Coupling Ass'y.	710296-001 (1)	710297-001 (1)	710298-001 (1)	710299-001 (1)	O/A	O/A
	Coupling Bushing	730275-001 (3)	730275-002 (3)	730275-003 (4)	730275-004 (4)	—	—
	Setscrew	040940-041 (2)	040940-003 (2)	040940-003 (2)	040940-067 (2)	—	—
	Coupling Pin	730278-001 (3)	730278-002 (3)	730278-003 (4)	730278-004 (4)	—	—
	N/R Coupling Ass'y.	710301-001 (1)	710302-001 (1)	710303-001 (1)	710334-001 (1)	O/A	O/A
	Mounting Screw	074118-062 (3)	074118-077 (3)	074118-093 (4)	074118-110 (4)	—	—
	Flat Washer	074117-004 (3)	074117-006 (3)	074117-009 (4)	074117-013 (4)	—	—
	Setscrew	040940-041 (2)	040940-003 (2)	040940-003 (2)	040940-067 (2)	—	—

Note:

Please include clutch catalog number when ordering any spare parts.

ORC MODEL S SERIES PART NUMBERING SYSTEM



COUPLINGS

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CLUTCHES

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CERTIFICATE OF ORIGIN

Equipment: Centrifuge Equipment
Model: DE-1000 GBD, DE-1000 FHD, DE-1000 VFD
Characteristics: 0-600VAC, 50/60Hz, 3PH

Derrick Corporation certifies that the above described articles are of the growth, product, or manufacture of the United States of America and the prices true and correct. Material furnished is in accordance with the requirements of order.

THESE COMMODITIES, TECHNOLOGIES, OR SOFTWARE WERE EXPORTED FROM THE UNITED STATES IN ACCORDANCE WITH THE EXPORT ADMINISTRATION REGULATIONS. DIVERSION CONTRARY TO U.S. LAW PROHIBITED.

Date: 2-June-2005

Signature: Carl E. Root



CERTIFICATE OF QUALITY

Equipment: Centrifuge Equipment
Model: DE-1000 GBD, DE-1000 FHD, DE-1000 VFD
Characteristics: 0-600VAC, 50/60Hz, 3PH

Derrick Corporation certifies that the delivered goods for the above referenced order conforms to the requirements of the specified order in that all construction materials and components are new and unused, manufactured for this order, and that the goods are free of any known defects as to their design, material, and workmanship. We also certify that the goods are of high grade and consistent with the established and generally accepted standards of material for the type ordered.

Date: 2-June-2005

Signature: Carl E. Root



SHIPPING FINAL INSPECTION AND RUN TEST CERTIFICATE

Equipment: Centrifuge Equipment
Model: DE-1000 GBD, DE-1000 FHD, DE-1000 VFD
Characteristics: 0-600VAC, 50/60Hz, 3PH

The equipment listed above was inspected and found to be in conformance with Derrick's internal coating, run test, and assembly inspection documents that were required for the type of equipment manufactured in accordance with the Derrick Quality System. Applicable internal inspection documents available upon request.

Date: 2-June-2005

Signature: Carl E. Root



Document No: PE-S-036-02-06

CERTIFICATE OF CONFORMANCE

Equipment: Mining & Oilfield equipment
manufactured specifically for Hazardous
Location Areas including but not limited to:
Flo-Line Cleaners, Primers, Agitators,
Degassers, Centrifuges, Centrifugal Pumps,
Scalpers, etc.


Rating and principal
characteristics: 0 - 600VAC , 50/60Hz, 3PH

Model/Type ref.: Various

Additional information: None

This product was found to be in conformance with (as a minimum):

**U.L. listed for hazardous locations Class I, Groups C & D, which
is similar to equipment marked as EExd IIB T3 for Zone 1 areas.
Assembled in accordance with National Electrical Code (NEC) –
articles 500 thru 504 (hazardous locations).**

Signature: 
for
Thomas Silvestrini

[illegible]

Effective Date 15 Apr 05

Page ____ of ____

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Notes:

[illegible]

Effective Date 15 Apr 05

Page ____ of ____

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Notes:

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